THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

AGRICULTURAL RESEARCH ADMINISTRATION

UNITED STATES DEPARTMENT OF AGRICULTURE

NATION-WIDE RESULTS WITH FUNGICIDES IN 1949
FIFTH ANNUAL REPORT

Supplement 192 May 15, 1950

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

PLANT DISEASE REPORTER SUPPLEMENT

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

NATION-WIDE RESULTS WITH FUNGICIDES IN 1949
FIFTH ANNUAL REPORT

Compiled by
The Fungicide Committee of the American Phytopathological Society:
Sub-Committee on Testing and Results of Newer Fungicides[1]

Plant Disease Reporter
Supplement 192 May 15, 1950

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1949 SUMMARY OF RESULTS WITH FUNGICIDES

The continued response of plant pathologists in the United States and Canada has again made it possible for the sub-committee on testing and results of newer fungicides to summarize this information. The reports from 196 cooperators include results with 215 different materials on 55 different crops. Thanks are due all who cooperated.

This year's report has been delayed because of a change in committee personnel. Fortunately, however, the previous committee, under the chairmanship of J. W. Heuberger, had already done the preliminary spade-work for the 1949 summary by mailing out questionnaires to cooperators. The present committee is indebted to Dr. Heuberger and the members of his committee. The committee also appreciates the services of Dr. C. E. Cox and Dr. S. P. Doolittle who kindly summarized most of the vegetable work when drafted at the last minute.

This summary does not in any way represent final conclusions or imply recommendations of any sort. It is necessarily incomplete in scope as it summarizes only the results of the 1949 experiments that were submitted to the committee by cooperators. It has been prepared solely for the information of professional people concerned with plant disease control. It probably gives a fair indication of the current trend of results with new fungicides and also brings out some of the variations in performance met with by workers in different areas. In many cases it is difficult to explain these variations. Their occurrence, however, points to the existence of important factors influencing the effectiveness or safety of the fungicides.

The committee would appreciate any suggestions or criticisms regarding this report. There is some uncertainty regarding publication of these reports in future years due to lack of funds. Some means should be provided for financing this publication in the future.

LIST OF COOPERATORS

State or Province	Cooperators	Place[2]
ALABAMA	D. L. Gill	Spring Hill
	R. L. Self	Auburn
	Coyt Wilson	Auburn & Fairhope
	Harold E. Yates	Fairhope
ARKANSAS	E. M. Cralley	Fayetteville
	H. R. Rosen	Fayetteville
CALIFORNIA	J. G. Bald	Los Angeles
	M. Cohen	Berkeley
	W. H. English	Davis
	L. J. Klotz	Riverside
	P. A. Miller	Los Angeles
	E. E. Wilson	Davis
	C. E. Yarwood	Berkeley
	G. Zentmeyer	Riverside
COLORADO	R. R. Baker	Fort Collins
	R. W. Graham	Fort Collins
	J. H. Henderson	Fort Collins
	W. J. Henderson	Montrose
	Robert L. Skiles	Rocky Ford
	W. D. Thomas, Jr.	Fort Collins
CONNECTICUT	P. J. Anderson	Windsor
	S. Rich	New Haven
	E. M. Stoddard	New Haven
DELAWARE	D. F. Crosson	Newark, Selbyville
	J. W. Heuberger	Newark, Selbyville, & Bridgeville
	P. O. Poulos	Bridgeville
FLORIDA	W. H. Chapman	Quincy
	Fred Clark	Gainesville
	Robert A. Conover	Homestead
	R. R. Kincaid	Quincy
	S. C. Litzenberger	Gainesville
	R. O. Magie	Bradenton
	G. K. Parris	Leesburg
	G. D. Ruehle	Homestead
	G. R. Townsend	Belle Glade
GEORGIA	J. R. Cole	Albany
	F. F. Cowart	Experiment

State or Province	Cooperators	Place
(Georgia)	John G. Gaines	Tifton
	U. R. Gore	Experiment
	E. F. Savage	Experiment
HAWAII	J. W. Hendrix	Maui
	H. Murakiski	Kokohead, Oahu
IDAHO	Harland Stevens	Aberdeen
	R. D. Watson	Moscow
ILLINOIS	Wayne Bever	Urbana
	J. C. Carter	Urbana
	R. G. Emge	Urbana
	J. L. Forsberg	Kankakee County
	J. W. Gerdeman	Urbana
	Benjamin Koehler	Urbana
	M. B. Linn	Urbana
	Dwight Powell	Urbana
INDIANA	R. M. Caldwell	Lafayette
	D. E. Likes	Lafayette
	Eric G. Sharvelle	Lafayette
	J. R. Shay	Bridgeport
IOWA	H. L. Lantz	Ames
	C. S. Reddy	Ames
KANSAS	E. Abmeyer	Walthena
	E. D. Hansing	Manhattan
KENTUCKY	D. A. Reid	Lexington
LOUISIANA	J. G. Atkins, Jr.	Crowley, Hammond
	Paul Bouchereau	Crowley
	N. E. Jodon	Crowley
	E. C. Tims	Baton Rouge
MAINE	M. T. Hilborn	Monmouth
MARYLAND	C. E. Cox	College Park
	John C. Dunegan	Beltsville
	M. C. Goldsworthy	Beltsville
	W. F. Jeffers	College Park
	R. W. Leukel	Beltsville
	W. D. McClellan	Beltsville
	H. A. Rodenhiser	Beltsville
	J. W. Taylor	Beltsville
	R. A. Wilson	Beltsville

State or Province	Cooperators	Place
MASSACHUSETTS	Geoffrey Cornish	Amherst
	E. F. Guba	Waltham
MICHIGAN	J. H. Muncie	Lake City
	Ray Nelson	East Lansing
	W. Toenjes	Grand Rapids
	John R. Vaughn	East Lansing
	Donald J. de Zeeuw	East Lansing
MINNESOTA	A. D. Baskin	Crookston
	T. M. McCall	Crookston
	M. B. Moore	St. Paul
	H. D. Thurston	Crookston
MISSOURI	H. G. Swartwout	Columbia
MONTANA	Francis H. McNeal	Bozeman
NEW HAMPSHIRE	M. C. Richards	Durham
NEW JERSEY	J. C. Campbell	Cranbury
	R. H. Daines	Morristown
	B. H. Davis	New Brunswick
	Spencer H. Davis	New Brunswick
	John C. Dunegan	Hammonton
	M. C. Goldsworthy	Hammonton
	C. M. Haenseler	New Brunswick
	J. M. Horn	Hammonton
	R. A. Wilson	Hammonton
NEW YORK	A. Braun	Geneva
	C. A. Davis, Jr.	Ithaca
	A. W. Dimock	Ithaca
	C. H. Ford	Farmingdale
	A. A. Foster	Farmingdale
	J. M. Hamilton	Geneva
	J. B. Harry	Yonkers
	S. E. A. McCallan	Yonkers
	L. M. Massey	Ithaca
	A. G. Newhall	Ithaca, Elba
	D. H. Palmiter	Poughkeepsie
	O. A. Reinking	Geneva
	W. T. Schroeter	Geneva
	D. M. Yoder	Ithaca
NORTH CAROLINA	C. N. Clayton	Raleigh
	John C. Dunegan	Eagle Springs

State or Province	Cooperators	Place
(North Carolina)	M. C. Goldsworthy	Eagle Springs
	F. A. Haasis	Wilmington
	T. T. Hebert	Raleigh
	J. M. Horn	Eagle Springs
	S. G. Lehman	Raleigh
	G. B. Lucas	Oxford
	E. L. Moore	Oxford
	R. A. Wilson	Eagle Springs
NORTH DAKOTA	W. E. Brentzel	Fargo
	W. G. Hoyman	Northwood
OHIO	H. A. Runnels	Wooster
	J. D. Wilson	Wooster, Marietta, Willard
	H. F. Winters	Wooster
	H. C. Young	Wooster
OREGON	B. F. Dana	Corvallis
	J. R. Kienholz	Hood River
	P. W. Miller	Corvallis
	A. P. Steenland	Corvallis
	E. K. Vaughan	Corvallis
PENNSYLVANIA	W. G. Chandler	State College
	F. H. Lewis	Arendtsville
	R. M. Means	Philadelphia
	H. W. Thurston, Jr.	State College
RHODE ISLAND	F. L. Howard	Kingston
	John B. Rowell	Kingston
SOUTH CAROLINA	C. H. Arndt	Clemson
	Robert Aycock	Blackville
	John C. Dunegan	Johnston
	W. M. Epps	Charleston
	H. H. Foster	Gramling
	M. C. Goldsworthy	Johnston
	T. W. Graham	Florence
	J. M. Horn	Leesville
	R. A. Wilson	Leesville
SOUTH DAKOTA	C. M. Nagel	Brookings
TENNESSEE	E. L. Felix	Knoxville
TEXAS	A. A. Dunlap	College Station
	J. R. Quinby	Chillicothe

State or Province	Cooperators	Place
(Texas)	J. C. Stevens	Chillicothe
	E. C. Tullis	Beaumont
	P. A. Young	Jacksonville
VERMONT	T. Sproston	Bennington
VIRGINIA	A. B. Groves	Winchester
	R. G. Henderson	Blacksburg
	T. J. Nugent	Norfolk
	S. A. Wingard	Blacksburg
WASHINGTON	M. W. Carstens	Mt. Vernon
	C. J. Gould	Puyallup
	S. C. Holton	Pullman
	F. Johnson	Puyallup
	J. R. Kienholz	Yakima
	V. L. Miller	Puyallup
	A. E. Rich	Grandview
	H. S. Schaad	Grandview
	R. Sprague	Wenatchee
	C. M. Wright	Walla Walla
	Wm. D. Yerkes	Walla Walla
WEST VIRGINIA	C. F. Taylor	Kearneysville
WISCONSIN	D. J. Hagedorn	Madison
	Paul E. Hoppe	Madison
	G. W. Keitt	Sturgeon Bay
	J. D. Moore	Sturgeon Bay
	O. J. Noer	Madison
	R. G. Shands	Madison
CANADA		
BRITISH COLUMBIA	D. L. McIntosh	Summerland
	H. R. McLarty	Summerland
	G. R. Thorpe	Creston Valley
	M. P. D. Trumpour	Salmon Arm
	M. F. Welsh	Creston Valley
	J. M. Wilks	Creston Valley
MANITOBA	J. E. Machacek	Fort Garry
NOVA SCOTIA	K. A. Harrison	Kentville
	J. R. Hockey	Kentville
	R. G. Ross	Kentville

State or Province	Cooperators	Place
(Canada)		
ONTARIO	J. H. Boyce	Ottawa
	G. C. Chamberlain	St. Catherines
	J. K. Richardson	St. Catherines
	S. A. Simmons	Guelph
	A. J. Skolko	Ottawa
	M. D. Sutton	Ottawa
PRINCE EDWARD ISLAND	L. C. Callbeck	Charlottetown
SASKATCHEWAN	R. C. Russell	Saskatoon

[2] In most cases, place where work was done.

SOURCES OF CHEMICALS TESTED

Agro-Chemie	Velperweg 28 Arnhem, Holland
Arkansas Fertilizer Company	Little Rock, Arkansas
Battelle Memorial Institute	Columbus, Ohio
F. W. Berk & Company, Inc.	Wood-Ridge, New Jersey
Boots Pure Drug Co., Ltd.	Station Street, Nottingham, England
California Spray Chemical Corp.	Elizabeth, New Jersey
Calumet and Hecla Min. Co.	Pittsburgh, Pa.
Canadian Industries, Ltd.	Agricultural Chemicals Division Box 10, Montreal, Canada
Carbide and Carbon Chemical Corp.	30 East 42nd Street New York 17, New York
Central Chemical Corp.	Hagerstown, Maryland
Chipman Chemical Co.	Bound Brook, New Jersey
Clorox Chemical Co.	850 42nd Avenue, Oakland 1, Calif.
W. D. Cleary Corp.	314 Cleveland Avenue New Brunswick, New Jersey
Corona Chemical Company	Milwaukee, Wisconsin
Delmar Chemicals, Ltd.	Lashine, Quebec, Canada
Doggett-Pfeil Company	Springfield, New Jersey
Dominion Rubber Company	Metcalf Street Guelph, Ontario, Canada
Dow Chemical Company	Midland, Michigan
E. I. Du Pont de Nemours & Co.	DuPont Building, Wilmington, Delaware
Eastern Chemical Corp.	Crozet, Virginia
Esso Standard Oil Company	378 Stuart Street, Boston 17, Mass.

Flower Food, Inc.	P. O. Box 106, Maywood, Illinois
French Dyestuffs Ltd.	Hamilton, Ontario, Canada
Fuller System, Inc.	Woburn, Massachusetts
Gallowhur Chemical Corp.	801 Second Avenue New York 17, New York
Geigy Co., Inc.	89-91 Barclay Street, New York 8, N. Y.
General Chemical Co.	40 Rector Street, New York 6, N. Y.
Givaudan-Delawanna, Inc.	330 W. 42nd Street, New York 18, N. Y.
B. F. Goodrich Chemical Co.	324 Rose Building, Cleveland 15, Ohio
Green Cross Insecticides	2875 Centre Street, Montreal, Quebec
Imperial Chemical Industries, Ltd.	Hexagon House, Blackley Manchester, England
Innis, Speiden & Company	117 Liberty Street, New York 6, N. Y.
Jackson & Perkins	Newark, New York
Mallinckrodt Chemical Works	2nd and Mallinckrodt Streets St. Louis, Missouri
Merck and Co., Inc.	Rahway, New Jersey
Micronizer Process Co.	Moorestown, New Jersey
Monsanto Chemical Company	1700 South 2nd Street St. Louis 4, Missouri
New Jersey Zinc Co.	160 Front Street, New York 7, N. Y.
Niagara Sprayer and Chemical Co.	Middleport, New York
Onyx Oil and Chemical Co.	15 Exchange Place, Jersey City 2, N. J.
Panogen, Inc.	117 Hudson Street, New York, N. Y.
Parsons Chemical Works	Grand Lodge, Michigan
Pennsylvania Salt Manufacturing Co., Inc.	1000 Widener Bldg. Philadelphia 7, Pa.
Phelps-Dodge Refining Corp.	40 Wall Street New York, N. Y.

Plant Products Co.	Eatondale Avenue Blue Point, L. I., New York
John Powell & Co., Inc.	One Park Avenue, New York 16, N. Y.
R. J. Prentiss and Co.	80 John Street, New York, N. Y.
H. H. Robertson & Co.	Farmers Bank Bldg., Pittsburgh, Pa.
H. P. Rossiger and Co., Inc.	55 Vandam Street, New York 13, N. Y.
Rohm and Haas Co.	222 W. Washington Square Philadelphia 5, Pennsylvania
Shell Chemical Corp.	100 Bush St., San Francisco 6, Calif. or 50 W. 50th St., New York 20, N. Y.
Sherwin-Williams Co.	101 Prospect Avenue, NW Cleveland, Ohio
Standard Agricultural Chemicals, Inc.	1308 Adams Street Hoboken, New Jersey
Standard Oil Co. of Indiana	910 South Michigan Avenue Chicago 80, Illinois
Stauffer Chemical Co.	420 Lexington Avenue, New York 17, N. Y. or 626 California St., San Francisco 8, Calif.
Tennessee Copper Co.	900 Roosevelt Highway College Park, Georgia
Texas Phenothiazine Co.	Fort Worth, Texas
The Natriphene Co.	424 Book Bldg., Detroit 26, Michigan
United States Rubber Company	Naugatuck Chemical Division 1230 Sixth Avenue, New York 20, N. Y.
Upjohn Company	Kalamazoo, Michigan
R. T. Vanderbilt Co., Inc.	230 Park Avenue, New York 17, N. Y.
Winthrop Chemical Company, Inc.	1450 Broadway, New York 18, N. Y.
Woolfolk Chemical Company	Fort Valley, Georgia

FUNGICIDES USED IN 1949

Trade Name	Active Principle	Source
Actidione	cycloheximide	Upjohn Company
Agrosan	1.5% phenyl mercury acetate + 0.5% ethyl mercury chloride	Imperial Chemicals
Alltox-K Dust No.10-63	10% toxaphene with 6.3% copper	California Spray Chemical
Ammoniacal copper carbonate	ammoniacal copper carbonate	Homemade
Anti carie	48% hexachlorobenzene	French Dyestuffs
Apple coposil	copper silicate-zinc combination	California Spray Chemical
Arasan	50% thiram	DuPont
Arasan SF	75% thiram	DuPont
Arathane WP-25	dinitrocapryl crotonate	Rohm & Haas
Aretan	methoxy ethyl mercury chloride + alkali	Agro-Chemie
Basi-Cop	neutral insoluble copper	Sherwin-Williams
Battelle Copper Fungicide	50% metallic copper paste	Battelle Institute
Benesan	0.15% ethyl mercury chloride + 0.85% phenyl mercury acetate + 20% benzene hexachloride	Canadian Industries
Bioquin 1	copper 8-quinolinolate	Monsanto
Bismuth subsalicylate	bismuth subsalicylate	Various
Bloomocide	alkyl dimethyl benzyl ammonium chloride	Flower Food, Inc.
Bordeaux mixture	basic copper sulfates	Homemade
Bouisol	copper oxychloride in white oil emulsion	Boots Pure Drug Co.
Cadminate	organic cadmium compound	Mallinckrodt
Calcium chloride	calcium chloride	Various
Calochlor	mercurous chloride and mercuric bichloride	Mallinckrodt
Calogreen	mercuric chloride	Mallinckrodt
Carbide and Carbon 224	zinc mercury chromate	Carbide and Carbon
Carbide and Carbon 531	chromate complex	Carbide and Carbon
Carbide and Carbon 5379	ethylene bisdithiocarbamate derivative	Carbide and Carbon
Carbide and Carbon 640	copper zinc chromate complex	Carbide and Carbon
Ceresan, 2%	ethyl mercury chloride	DuPont
Ceresan M	ethyl mercury p-toluene sulfonanilide	DuPont

Trade Name	Active Principle	Source
Ceresan, New Improved	ethyl mercury phosphate	DuPont
Chlordane	chlordane	Various
Chlorax dry	sodium chlorate-pentaborate mixture	Chipman Chemical Co.
Chlorax liquid	sodium chlorate-metaborate mixture	Chipman Chemical Co.
Chromate complex A	copper-zinc chromates	Penna. Salt Mfg. Co.
Chloropicrin	chloropicrin	Various
Clorox	sodium hypochloride solution	Chlorox Chemical Co.
C.O.C.S.	basic copper oxychloride and sulfates	Niagara Sprayer
Colloidal copper-white oil emulsion	3% copper, 63% petroleum oil	Boots Pure Drug Co.
Compound A	copper oxychlorides	DuPont
Cop-O-Zink	tribasic copper sulfate + zinc sulfate	Tennessee Copper Co.
Copper A	copper oxychlorides	DuPont
Copper 8	copper 8-quinolinate	Monsanto
Coppercarb	20% copper as copper carbonate	Corona Chemical
Copper oxide	copper oxide	Various
Copper 054	copper gamma chloro aceto acetanilide	Delmar Chemicals
Copper sulfate	copper sulfate	Various
Copper salt of TMTD	copper salt of thiram	Geigy
CP 2271	copper compound	Monsanto
CR 305	bis (2 hydroxy-5 chlorophenyl) sulfide	Rohm & Haas
CR 2139	not known	Rohm & Haas
CR 2228	not known	Rohm & Haas
CR 2256	not known	Rohm & Haas
CR 2320	not known	Rohm & Haas
Crag 169	copper zinc chromates	Carbide and Carbon
Crag 341-B	mixed glyoxalidines	Carbide and Carbon
Crag 341-C (Fruit)	mixed glyoxalidines	Carbide and Carbon
Crag 341-SC	mixed glyoxalidines from pure stearic acid	Carbide and Carbon
Crag 531	calcium-zinc-copper-cadmium chromates	Carbide and Carbon
Crag 640	copper-zinc-chromates	Carbide and Carbon
Crag 658	copper-zinc-chromates	Carbide and Carbon
Cuprocide, yellow	yellow-cuprous oxide	Rohm & Haas
Cuprous oxide	red cuprous oxide	Calumet & Hecla Mining Co.

Trade Name	Active Principle	Source
Cuprous oxide	red cuprous oxide	Calumet & Hecla Mining Co.
Cuprous powder # 3005	cuprous oxide powder	H. H. Robertson Co.
Cu-26	basic copper zeolites	Tennessee Copper Co.
D-D	dichloropropene-dichloropropane	Shell Chemical Co.
Delmo-Z	stabilized zinc hydroxide	California Spray Chemical
Dithane D-14	disodium ethylene bis dithiocarbamate	Rohm & Haas
Dithane-cadmium	cadmium ethylene bis dithiocarbamate	Rohm & Haas
Dithane-calcium	calcium ethylene bis dithiocarbamate	Rohm & Haas
Dithane-ferric	ferric ethylene bis dithiocarbamate	Rohm & Haas
Dithane-magnesium	magnesium ethylene bis dithiocarbamate	Rohm & Haas
Dithane-manganese	manganese ethylene bis dithiocarbamate	Rohm & Haas
Dithane Z-78	zinc ethylene bis dithiocarbamate	Rohm & Haas
Dimetacresyltrichloroethane	dimetacresyltrichloroethane	
Dow F-800	50% trichlorophenyl monochloro acetate	Dow
Dow 9B	zinc trichlorophenate	Dow
Dow W-40	ethylene dibromide	Dow
Dowicide B	sodium trichlorophenate	Dow
DuPont Garden Dust	5.2% zineb + 5% methoxychlor + rotenone	DuPont
DuPont Rose Dust	Fermate-sulfur mixture	DuPont
Dry lime sulfur	calcium polysulfides	Sherwin-Williams
Elgetol	sodium dinitro-ortho-cresolate	Standard Agricultural Chemical Co.
Everett flotation sulfur	by-product sulfur	
Fac-S	ferric dimethyl dithiocarbamate cyclohexylamine	Goodrich Chemical Co.
Fermate	ferric dimethyl dithiocarbamate	DuPont
Flotation sulfur	by-product sulfur	Various
Flo-sol sulfur paste	by-product sulfur	Central Chemical Co.
Flotox	sulfur	California Spray Chemical
Formaldehyde	formaldehyde	Various
Fulex B	emulsion containing 33% copper 8-quinolinolate	Fuller System Inc.

Trade Name	Active Principle	Source
G-4	dihydroxydichlorodiphenylmethane	Givaudan-Delawanna
Gallicide	phenyl mercury monoethanol ammonium acetate	Gallowhur
G.C. 308	copper nitrodithioacetate	General Chemical Co.
G.C. 629	zinc nitrodithioacetate	General Chemical Co.
G.C. 1124	thiocyanate (dinitrophenyl)	General Chemical Co.
G.C. 1189	chlorinated hydrocarbon	General Chemical Co.
Goodrite Z.A.C.	ziram cyclohexylamine complex	Goodrich Chemical Co.
Goodrite Z.I.P.	ziram cyclohexylamine p.e.p.s.	Goodrich Chemical Co.
Granosan 2%	ethyl mercury chloride	DuPont
H-258-A	organic cadmium	Merck and Co.
Iscobrome D	ethylene dibromide	Innis, Speiden & Co.
Isothan Q 15	lauryl isoquinolinium bromide	Onyx Chemical Co.
J. & P. Rose Spray	30% Fermate, 20% DDT, 10% sulfur	Jackson and Perkins
Karbam Black	ferbam	Sherwin-Williams
KF 467	bi-(ethyl mercuric) perthiocyanate	Coppers Co.
Kolodust	bentonite fused with sulfur	Niagara Sprayer
Kolofog	bentonite fused with sulfur	Niagara Sprayer
Kolozinc	sulfur-zinc complex	Niagara Sprayer
Koppers Flotation Sulfur paste	by-product sulfur	California Spray Chemical
Larvacide	chloropicrin	Innis, Speiden & Co.
L-224	zinc-mercury-chromate	Carbide and Carbon
Leytosan	7.2% phenyl mercury urea	F. W. Berk
Lime-sulfur	calcium polysulfides	Various
Lindane	gamma isome of benzene hexachloride	Various
Lysol	50% tar acids and soaps	Various
Magnesium ethylene bis dithiocarbamate	magnesium ethylene bis dithiocarbamate	DuPont

| Trade Name | Active Principle | Source |

Trade Name	Active Principle	Source
Magnesium ethylene bis dithiocarbamate	:magnesium ethylene bis dithiocarbamate	:DuPont
Magnetic sulfur "70"	:sulfur paste	:Stauffer Chemical Co.
Manganese ethylene bis dithiocarbamate	:manganese ethylene bis dithiocarbamate	:DuPont
Mercan	:5% para amino phenyl mercuric acetate	:John Powell and Co.
Merck H 250 T	:organic cadmium compound	:Merck & Co.
Mercuran	:methoxy ethyl mercuric acetate	:Delmar Chemicals
Mercuric chloride	:mercuric chloride	:Various
Mersolite 8	:phenyl mercuric acetate	:F. W. Berk
Mersolite P	:2% phenyl mercuric acetate in Bentonite	:F. W. Berk
Methasan	:ziram	:Monsanto
Merthon 642	:mercury complex with organic phosphates	:Eastern Chemical Corp.
Methoxychlor	:methoxychlor	:Various
Micronized sulfur	:finely ground sulfur	:Micronizer Process Co.
Microsul	:finely ground sulfur	:Central Chemical Co.
Mike sulfur	:finely ground sulfur	:Dow Chemical Co.
MTH	:75% nitroso phthalimidine	:Dominion Rubber Co.
Natriphene	:sodium 2-hydroxydiphenyl	:The Natriphene Co.
Niagara carbamate	:ferbam	:Niagara Sprayer
N-Nitroso phthalimidine	:N-nitroso phthalimidine	:U. S. Rubber Co.
No. 5400	:sodium dimethyl dithiocarbamate + SCl_2	:Delmar Chemicals
Nu-leaf	:ferbam	:Niagara Sprayer
Nu-Z	:zinc oxysulfate (55% zinc)	:Tennessee Copper Co.
$N\text{-}Cl_3$	:nitrogen trichloride	:Various
Parathion	:parathion	:Various
Panogen-8	:1.2% methyl mercury dicyan diamide in glycol and alcohol	:Panogen, Inc.
Panogen-14	:2.1% methyl mercury dicayan diamide in oil	:Panogen, Inc.
Parsons Seed Saver	:quarternary ammonium compound + mercury	:Parson Chemicals
Parzate	:zineb	:DuPont
Peach Ban	:zinc-sulfur-lead arsenate complex	:Woolfolk Chemical Co.
Penn 492	:	:Penna. Salt Mfg. Co.

Trade Name	Active Principle	Source
Perenox	copper oxychloride	Canadian Industries
Phelps Dodge IP 1-50	48-50% metallic copper	Phelps Dodge
Phygon	2, 3-dichloro-1, 4-naphthoquinone	U. S. Rubber
Piperonyl cyclonene	piperonyl cyclonene	Texas Phenothiazine Co.
PMAS	phenyl mercury complex	W. A. Cleary Corp.
Polysulfide compound	sodium polysulfide and sodium thiosulfate	Niagara Sprayer
Propylene oxide	propylene oxide	Various
Puratized Agricultural Spray	phenyl mercury triethanol ammonium lactate	Gallowhur
Puratized Apple Spray	phenyl mercury monoethanol ammonium acetate	Gallowhur
Puratized 806	phenyl mercury formamide	Gallowhur
Puraturf	phenyl mercury triethanol ammonium lactate	Gallowhur
Puraturf G-G	organic cadmium-mercury complex	Gallowhur
Puraturf 177	p-amino phenyl cadmium dilactate complex	Gallowhur
R-118 A	4% ethyl mercury isothio carbamide	Green Cross Insecticides
Rix	calcium polysulfides and polyethylene glycol monoisooctylphenyl ether	California Spray Chemical
Robertson's Copper Fungicide	cuprous oxide	H. H. Robertson Co.
Ro-Cop	0.75% rotenone, 5% copper	Doggett-Pfeil
Rogers C-D Tomato Dust	6% copper with 5% DDT	Texas Phenothiazine Co.
Roccal	alkyl dimethyl benzyl ammonium chloride	Winthrop Chemical Co.
Rosinamine-D-silver nitrate	rosinamine-D silver nitrate	
Rosin lime-sulfur	rosin and lime-sulfur	Homemade
Seedox	50% 2, 4, 5-trichlorophenyl acetate	R. J. Prentiss
Semesan	30% hydroxymercurichlorophenol	DuPont
Semesan Bel	12% hydroxymercurinitrophenol, 3.2% hydroxymercurichlorophenol	DuPont
Spergon	tetrachloro-parabenzoquinone	U. S. Rubber
Spergon W	tetrachloro-parabenzoquinone	U. S. Rubber
Spraycop	34% metallic copper	General Chemicals
SR 406	N-trichloromethyl thio-tetrahydrophthalimide	Esso Standard Oil Co.
Stanofide	dimethyl dialkyl ammonium bromide in alcoholic base	Standard Oil of Indiana

Stanolite	:dimethyl dialkyl ammonium bromide in alcoholic base	:Standard Oil of Indiana

Trade Name	Active Principle	Source
Sulfasan	:xanthogen disulfide	:Monsanto
Sulforon X	:wettable sulfur	:DuPont
Sulfur dust	:finely ground 325 mesh sulfur	:Various
Sulfur-lead arsenate	:90 parts dusting sulfur: 10 parts lead	:Various
Sulfur wettable	:wettable sulfur	:Various
S.W. XP41A	:xanthogen disulfide	:Sherwin Williams
Tag HL 331	:phenyl mercury acetate	:California Spray Chemical
Tennessee 26	:basic copper zeolites	:Tennessee Copper Co.
Tennessee 34	:basic copper zeolites	:Tennessee Copper Co.
Tennessee Mixture No. 1	:36% Cu, 7.6% Mn, 4.5% Zn	:Tennessee Copper Co.
TEPP	:tetraethyl pyrophosphate	:Various
Teramine	:quarternary ammonium compound	:Canadian Industries
Tersan	:Thiram	:DuPont
Thionate "19"	:ferbam	:DuPont
Thiourea	:thiourea	:Various
Toxaphene	:toxaphene	:Various
Tribasic copper sulfate	:copper basic sulfates	:Tennessee Copper Co.
Vancide 30-W	:zinc salt of 5 chloro-2 mercaptobenzothia-zole	:R. T. Vanderbilt & Co.
Vancide 38-W	:	:R. T. Vanderbilt & Co.
White Diamond 63 X Tomato dust	:6.25% copper from tribasic copper sulfate and 13.75% calcium arsenate	:Arkansas Fertilizer Co.
Z.A.C.	:ziram cyclohexylamine complex	:Goodrich Chemical Co.
Zerlate	:ziram	:DuPont
Zinc-lime-sulfur mix	:basic zinc sulfates and sulfur	:Various
Zinc lime	:zinc sulfate + hydrated lime	:Various
Zinc oxide	:zinc oxide	:New Jersey Zinc Co.
Zinc sulfide	:zinc sulfide	:New Jersey Zinc Co.
Zinc basic sulfate (ME.2287)	:zinc sulfate neutral	:Niagara Sprayer

Trade Name	Active Principle	Source
Zinc lime-hydrated (ME. 2433)	zinc basic sulfates alkaline	Niagara Sprayer
Z.I.P.	ziram cyclohexylamine p.e.p.s.	Goodrich Chemical Co.
36L	nitrosopyrazole	U. S. Rubber Co.
549 C-dust	0.9% parathion, 10% Fermate, 3% Bioquin 1	Plant Products Co.
549 C-spray	4% parathion, 30% Fermate, 10% Bioquin 1	Plant Products Co.
829	modified form of Crag 658	Carbide and Carbon

RESULTS WITH FRUIT DISEASES

APPLES

Reports were received from British Columbia, California, Colorado, Connecticut, Delaware, Illinois, Indiana, Kansas, Maine, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, North Carolina, Nova Scotia, Ohio, Ontario, Oregon, Pennsylvania, Rhode Island, Virginia, West Virginia, Washington, and Wisconsin.

SCAB

Information gathered from the submitted reports and from other sources indicated that the apple scab problem was most severe in the South Atlantic States of Delaware, Maryland, New Jersey, Pennsylvania, Virginia, and West Virginia. In this region summer drought curtailed late infection in Delaware and Pennsylvania. In the northern tier of States and also in Canada and in North Carolina apparently, in general, scab was not acute during the blossom period and presented no particular problem of control. This was also true of the Far West where scab was difficult to control during the previous season. In general the environmental conditions surrounding most of the tests this season were not effective in bringing out the differences between the spray materials used.

Fermate, Phygon XL, Crag apple fungicide 341C, Tag HL 331, Cr. 305, Puratized Agricultural Spray, Puratized Apple Spray, wettable sulfurs (all kinds) and liquid lime-sulfur were used most frequently in the tests. Arathane W and E, Puratized 806, Merthon 642, manganese ethylene bis dithiocarbamate, Hecla copper oxide, Goodrite Z.I.P. and Z.A.C., Merck H 258 A, Cop-O-Zink, Cr. 2139, 2228, 2256, 2330, Stanofide, Bioquin 1, Apple Coposil, Phygon dust, Actidione, and S.R. 406 were included in one or another test at the different stations.

Split schedules were used quite commonly, apparently for the purpose of alleviating the phytotoxic propensities of some of the chemicals especially where the mercury compounds were used in the early sprays. The mercury compounds were usually carried up to and including the first cover and were followed by Crag apple fungicide 341C, Fermate, or some form of wettable sulfur, or even mixtures of Fermate and sulfur. Lime sulfur was usually followed by Fermate and wettable or flotation types of sulfur, Phygon was followed by Fermate in one case, while Crag apple fungicide 341C and Fermate were followed by wettable sulfur in several cases.

Combinations of fungicides were used to some extent in an effort to improve the fungicidal efficiency of the respective chemicals. In this respect Crag apple fungicide 341C was mixed with Fermate, Puratized Agricultural Spray with Fermate, Fermate with Flotation sulfur and wettable sulfurs, Phygon with Fermate, Arathane W with Bioquin 1 and also with Puratized Agricultural Spray. The season was such that little was learned as to the efficacy of the above split schedules or combinations.

Phygon, Cr. 305, Tag HL 331, Puratized Agricultural Spray, and liquid lime-sulfur appeared to serve best in controlling the disease. Phygon dust appeared to be very effective in this respect. Since the mercury materials

were used in split schedules, their efficiency was confined to the bloom and first cover applications. Fermate, Crag Apple Fungicide 341C, Puratized Apple Spray, and the wettable sulfurs (Flotation included in this group) appeared next in importance, while the remainder of the compounds varied considerably in their performance from test to test. Fermate, for some reason, was not particularly effective in the South Atlantic States where heavy infection took place early. Cr. 305, a relatively new addition to the list of fungicides, was used in a number of the tests and appeared to possess some promise as a fungicide. Actidione was used in several tests but gave poor scab control.

In one test in Maryland where the control of scab was difficult, considerable success was obtained by applying Elgetol to the floor of the orchard just as the buds were breaking, and following this up with Tag HL 331 at the late calyx period.

Considering the merits of the various materials on the basis of their effects upon the plants, Phygon, Cr. 305, Tag HL 331, Crag 341C, and liquid lime-sulfur were found to possess objectionable characteristics. Phygon XL was found to russet Delicious fruit in Massachusetts, and this was thought to be caused by the added magnesium sulfate. In Massachusetts chlorosis of leaves also developed but the size of the fruit was normal. In Virginia Phygon + DN-111 caused severe fruit injury and in Pennsylvania the typical leaf chlorosis was observed. In Kansas severe fruit russeting developed on the fruits of the Winesap but not on the Jonathan varieties. In North Carolina the material produced delayed maturity. The addition of magnesium sulfate to Phygon at the Ontario station appeared to reduce chlorosis but it was observed that the trees sprayed with Phygon in 1948 produced a short crop in 1949. This was also observed in New York and New Hampshire. At the Nova Scotia station Phygon dust caused headaches with the personnel, and a paling of the treated leaves.

Cr. 305, used for the first time at many of the stations, produced russeting of the fruit at the New York, Vermont, Virginia, West Virginia, and Maine stations. At the New York station Cr. 305 treated fruits remained small, while at the Maine station the leaves were russeted and the fruit was spotted. Cr. 2228, 2256, 2320 caused russet of fruit at the Virginia station.

Actidione was found to cause severe leaf injuries and generally had to be dropped from the schedules after a few applications. Crag 341C, as nearly as we could tell, was used generally with lime. There were a few stations reporting its use without lime but probably the lime used was not set up in the tables presented to the committee. Foliage yellowing was observed very early in the season at the Vermont station, and fruit russeting was noticed at the New York station as well as leaf spotting and marginal burn which apparently was enhanced by dry, hot weather. At the Virginia station it was noted that the material irritated the personnel and caused serious petal injury at pre-pink. Foliage was also injured at an early stage and the injury was characterized as a contraction of the under surface of the leaves. Where DN-111 was mixed with 341C injury was much less pronounced. Russeting of fruit and leaf injury by 341C was reported from West Virginia on certain varieties. At the Ontario station this material did <u>not</u> cause any russeting such as was experienced in 1948.

Liquid lime-sulfur and the wettable sulfurs all were observed as causing their typical reactions on both leaves and fruits. In British Columbia where lime-sulfur was applied in concentrate machines, a considerable reduction in injury was observed with this practice. Tag HL 331 was observed as causing fruit russet and leaf injury in Vermont, while in British Columbia an application made closely on top of a residue of Fermate-Mulsoid sulfur was followed by a severe chlorosis and defoliation of Delicious apple trees. In Virginia it was also observed commonly that considerable leaf yellowing, necrosis, and defoliation was caused by the application of the mercury compounds on top of residues of Fermate. A severe leaf injury developed following the use of Merthon 642 in Virginia, when combined with DN-111 and Rhothane. In New York the mercury compounds apparently delayed the maturity of the fruit.

Fermate was usually recorded as being the safest material used. At one of the New York stations some stippling of the fruit of Rhode Island Greening was observed with the advent of high temperatures and in Virginia an enlargement of lenticels was noted where the material was used.

Some of the lesser used materials were also observed as causing some injury. H 258 A caused severe injury to fruit in Virginia and Maine, and leaf-shot-hole in Maine. Goodrite Z.I.P. caused typical zinc russeting of fruit in Virginia. Stanofide caused a chlorosis of foliage at one station. Hecla copper oxide caused a severe leaf fall and some fruit injury in Virginia and West Virginia, while Arathane emulsion caused a severe fruit russet in Oregon. The powdered Arathane W did not possess these characteristics to the same degree as the emulsion form.

RUST

Two rust experiments were reported. In the Virginia test various Cr. compounds, Goodrite Z.I.P. and Z.A.C., Magnetic 70, Puratized apple spray, Puratized Agricultural spray, Puratized 806 sprays, and Fermate were compared. The dithiocarbamate salt proved to be the best, while the mercury and Cr. compounds proved to be inferior. At the Poughkeepsie, New York, station Fermate, Cr. 305, Crag apple fungicide 341C, Crag apple fungicide 341C + Fermate, Phygon, Micronized sulfur, Puratized Agricultural Spray, Puratized Agricultural Spray + Fermate, and Tag HL 331 were compared. All of the sprays containing Fermate ranked first in control. Crag apple fungicide 341C was next, while all the others were unsatisfactory. Cr. 305 proved to be the poorest.

FRUIT SPOT (BROOKS)

Spot control experiments were conducted in New Jersey and in West Virginia. Ordinarily this disease is held under control in our properly sprayed orchards but for some reason or other many complaints concerning this trouble have come to our attention during the past two years. In the New Jersey test the applications started at prepink and continued until the 3rd cover. This was a normal spray schedule for apples. Lime-sulfur, wettable sulfur, Fermate, Crag apple fungicide 341C, Esso SR-406, Apple and Agricultural Puratized, and Tag HL 331 were compared. Of these materials Fermate and Esso SR-406 were the most satisfactory, while sulfur, lime

sulfur, and the mercury compounds proved to be the poorest. The mercury compounds, wettable sulfur, and Fermate were the safest, while lime-sulfur and Crag apple fungicide 341C caused some injury. Fermate and Esso SR-406 were considered as best, considering both control and safety, to use against this disease.

In West Virginia, Bordeaux mixture and Fermate were compared in a spray timing experiment on the Rome Beauty variety, while Fermate only was used on the Golden Delicious variety. The orchard had already received several previous sprays of other materials to control scab. The best control on the Rome variety was achieved by applying five cover sprays of Bordeaux mixture, starting May 27. The critical period for control on Rome appeared to come, in 1949, between the middle of June and the middle of July at which time both Bordeaux mixture and Fermate performed quite well in holding down the disease. On the Rome variety the best single spray was that one applied in the first week in July. On Golden Delicious no single application of Fermate was very effective and it was necessary to use at least three applications (beginning in the middle of June) of this material to get effective control.

FLY SPECK

One experiment was conducted in West Virginia against this disease on Rome Beauty and Golden Delicious. On Rome, Bordeaux mixture and Fermate were compared in a timing tests; and Fermate was used alone on the Golden Delicious variety. Apparently no single application of either material was very effective in controlling the disease. The best control, however, on both varieties with a single application, occurred when the materials were used about the middle of July, at which time both Bordeaux mixture and Fermate were about equal in performance. The best results followed the use of all five cover applications but the most economical series of sprays were those starting in early July and ending in early August. In general, it appeared that Fermate was more effective against this disease than Bordeaux mixture.

SOOTY BLOTCH

West Virginia reported one test against this disease. Like the Fly Speck experiment, the materials were applied in a timed series to discover the most effective period for control. Bordeaux mixture and Fermate were used on the Rome Beauty variety, while Fermate was used on the Golden Delicious variety. For Bordeaux mixture the best single application occurred in the middle of July, while with Fermate the best single application occurred in late May. Generally speaking, Bordeaux mixture was more effective than Fermate in the control of this disease on the Rome variety. The most effective series of applications of Bordeaux mixture and Fermate were those applied to the Rome variety between the last of May and the first week in July. On Golden Delicious the most effective series was that applied between the middle of June and the middle of July. These tests indicate that more attention to timing is necessary for the exact control of both Fly Speck and Sooty Blotch.

BITTER and BLACK ROT

One bitter rot and black rot control test was reported on from North Carolina. Nine applications were made on these plots: bloom, calyx, and seven covers. Forty-three percent of the fruit of the unsprayed trees suffered from bitter rot and 70 percent of the fruit was affected by black rot. Lime-sulfur, flotation sulfur, Phygon, Fermate, Cr. 305, Crag apple fungicide 341C, Puratized Agricultural Spray, and Tag HL 331 were used for comparison. Bordeaux mixture was applied to six covers of the lime-sulfur and Tag HL 331 plots, while Phygon was applied to the six covers of the Puratized plot. The best bitter rot control was experienced in the plots where Bordeaux mixture was used in the six cover plots and in the plot sprayed with Fermate. For the control of black rot of fruit none of the materials proved to be very effective. The best results appeared to follow the application of Tag HL 331 followed by Bordeaux mixture and Puratized Agricultural Spray followed by Phygon. Apparently the critical control was tied up with the early applications.

POWDERY MILDEW

Apple powdery mildew drew some attention in British Columbia, California, and Washington. At the British Columbia station at Summerland, Actidione, the antibiotic recovered from the staling liquor of growing Streptomyces griseus cultures, was used on Jonathan apple trees at the delayed dormant, prepink, pink, and calyx periods of growth. No report was made as to its effect upon the fungus but it was found that the material injured the foliage, caused a poor set, and a raised russetting of the fruit. At the California station Arathane W 25 and liquid lime-sulfur were compared. Arathane was found to be superior to lime-sulfur in the control of leaf infection. The lime sulfur caused leaf injury.

The two Washington stations were located at Yakima and at Wenatchee. At the Yakima station on the Jonathan variety Actidione, lime-sulfur, Arathan W and E Sulforon, tank-mixed Parzate, Esso SR-406, and $KMNO_4$ + wettable sulfur were compared. The materials were applied at early pink, early calyx, and first cover. The best control followed the use of lime-sulfur followed by the wettable sulfur (Sulforon), Arathane, $KMNO_4$ + sulfur, tank-mixed Parzate, Esso SR-406, and Actidione in that order. The lime-sulfur solution caused some marginal injury to leaves, while the Actidione antibiotic caused a severe spotting of the leaves.

At the Wenatchee station quite an extensive experiment was conducted. Here lime-sulfur solution was compared with Kolodust, Arathane W, Cr. 305, Fermate, Karbam Black, Zerlate, Zerlate + sulfur, Phygon XL, Parzate, Tag HL 331, Crag apple fungicide 341C + lime, Isothan 215, Vancide 30-W and 38-W, Preventol GD (G4) XP-41A and Actidione. The lime-sulfur was used at two concentrations at pink and calyx and also at one concentration at pink and calyx that was followed by Kolofog at first cover in one case and with Arathane W and Mike sulfur at four covers in two other cases. Zerlate + sulfur in all six applications gave the best control. Cr. 305 was next and Kolodust third. Arathane W following lime-sulfur and Kolofog following lime-sulfur came next and these were followed by lime-sulfur solution and lime-sulfur solution followed by Mike sulfur. Zerlate alone, Fermate, Phygon

XL, Karbam Black, Parzate, Tag HL 331, Crag 341C + lime, Isothan Q15, Vancides 30W and 38W, Preventol GD (G4), and Actidione failed to show promise. XP-41A was used only on several trees but showed some promise.

Actidione at 9 p.p.m. caused severe leaf burning and some injury at 3-5 p.p.m. Phygon XL caused leaf speckling and fruit blotch by late August, and Zerlate + sulfur, which gave the best degree of control, caused a slight scalding of the fruit in August.

FIRE BLIGHT

Colorado reported the use of Dithane Z78 + Triton B 1956 at 10 percent bloom and full bloom as being of some benefit in the control of fire blight.

CHERRIES

LEAF SPOT

Reports of leaf spot control experiments were sent in from Indiana, Pennsylvania, Wisconsin, and Ontario, Canada.

In Indiana early infection was light and a buildup did not occur until rainfall became more plentiful in late summer. Crag fungicide 341C + lime was compared with Bordeaux mixture and with Crag 341 - Bordeaux mixture in alternate sprays. These treatments were given to young nursery trees and 13 applications were made beginning in late April and extending through most of August. None of the materials used caused injury to the foliage. The best control occurred with the trees sprayed with Bordeaux mixture. The alternate schedule was next and Crag 341C was last.

At the Wisconsin station also the season was dry early and infection did not show up until after bloom on unsprayed trees. No leaf spot developed on any of the plots, so no information was developed as to the fungicidal properties of the various materials used. The materials used in four applications in these plots included Bordeaux mixture, Dithane D 14 + zinc sulfate, Cop-O-Zink, Tennessee Copper 34, Fermate, Crag 341B, C.O.C.S., and Crag 341C + lime. Split schedules were used in most of the plots with many of the above materials. When the fruit was sprayed with Fermate they turned dark and had a uniform color, while those sprayed with Crag 341 usually never turned dark in color.

From Pennsylvania two reports were submitted. In the first report five applications were made, at petal fall, shuck, and three covers. All plots were sprayed with lime sulfur in pink and Bordeaux mixture at post-harvest. Fermate, Crag 341B, Tennessee copper 26, and lime-sulfur-bordeaux mixture were compared. The best control resulted from the use of Fermate and Crag 341B. Next best was Tennessee copper 26 and the poorest control followed the use of the lime-sulfur-bordeaux mixture. Fermate proved to be the safest, while the lime-sulfur-bordeaux mixture combination caused the greatest injury. This injury was characterized by leaf scorching and fruit dwarfing. Crag 341B caused some marginal and spot necrosis and a bronzing of the leaf surfaces. The copper material caused leaf spotting, yellowing and leaf drop and fruit dwarfing.

In the second experiment the entire orchard was sprayed with lime-sulfur in pink. The treatments with the following materials took place at

petal fall, shuck, and three covers. Tennessee Copper 26, Cop-O-Zink, Hecla cuprous oxide, Crag 341C, Crag 341SC, Crag 341B followed by sulfur + Zerlate, Crag 341B followed by sulfur + Fermate, Cr. 305, and Phygon XL were used in the separate plots. The best control was exhibited by the Crag fungicides 341C and B. When followed by sulfur + Zerlate, however, 341B was inferior to 341B when used alone or when followed by sulfur + Fermate. Crag 341SC, made with the pure stearic acid, was considerably inferior to Crag 341C made with a mixture of high molecular fatty acids. The copper materials were next in order of efficiency, while Phygon XL and Cr. 305 were the poorest. Crag 341B followed by sulfur + Fermate proved to be the safest combination used, while Cr. 305 and Phygon XL proved to be unsafe. Cr. 305 caused small dead spots around the apical end of the fruits.

In Canada, at St. Catherines, leaf spot was not much of a factor in cherry growing this season and was easy to control. C.O.C.S. + lime, Cr. 305, Phygon + Mg SO_4, Crag 341B, and Esso SR 406 were compared. Since no disease showed up nothing was learned of the fungicidal properties of these materials. The copper material proved to be safest under the circumstances of this list, while Phygon + $MgSO_4$ caused the greatest injury.

BROWN ROT

One report was submitted from Oregon and one from Washington. In the test against blossom blight of sweet cherries, Puratized Agricultural Spray, Phygon XL, Fermate, Tag HL 331, Arathane W and Esso SR-406 were compared. Very little blossom blight developed during the early season and no comparison could be obtained as to the merits of the materials used. In the Washington State report Arathane, Fermate, Phygon XL, Roccal, Puratized Agricultural Spray, Crag 341C and lime-sulfur solution were compared as to their value in controlling brown rot spur blight. The applications were made at the pop-corn stage of bloom and 30 days later. The best control developed where the mercury compound was used followed closely by the Crag fungicide 341C + lime, Roccal, Phygon, and Fermate. The control with Arathane proved to be the poorest. Lime-sulfur and Arathane caused injury to the flower petals.

PEACHES

BROWN ROT

The disease during the 1949 season was not so important to peach growers as it was during the 1948 season. Even in the South losses were not so heavy as in former seasons. Probably the greatest damage occurred in the South Atlantic States. In the deep South and in the northern States the weather was generally dry at picking time and although a considerable potential of brown rot was present in many of the orchards, the fruit moved to market in fairly good shape. South Carolina, Virginia, and some Delaware and Maryland orchards reported considerable rot and this was due, no doubt, to heavy rains that developed at picking time in these areas.

The early spring all along the Atlantic Seaboard and into the South was marked by a long blooming season. Coupled with this was the delaying effect on the blooming habits of a number of varieties brought about by the

lack of enough cold treatment owing to the relatively warm winter. It was almost impossible in most of these areas to work out a satisfactory schedule of spray applications to protect any great portion of the developing bloom. As a result in may places considerable blossom blight developed despite the effort to control it.

North Carolina, in cooperation with the U. S. Department of Agriculture, reported one blossom blight control experiment. In this test three applications of liquid lime-sulfur were made during the early part of the bloom period up to the time when about 50 percent of the bloom were open. Counts at harvest time showed extensive brown rot losses on all plots, indicating that not enough of the blooms were protected.

In Delaware a report was submitted which shows the relation of the protection of bloom to the amount of potential inoculum that can be built up in the orchard at harvest time. Here it was shown that the number of bloom applications bears a direct correlation with the number of spore producing surface (blighted bloom, current season cankers, rotted fruit, etc.) found in the orchards.

In South Carolina two tests were reported where some effort was made to control brown rot at the blossom stage. In the first test liquid lime-sulfur, Phygon, wettable sulfur, Puratized Agricultural spray, and manganese ethylene bis dithiocarbamate were used at blossom time. In some cases two applications were made and in others only one bloom spray was applied. The cover sprays (post bloom) varied somewhat among the plots but all received at least one sulfur application, while others received a full complement of seven applications of sulfur. Phygon, Cr. 305, liquid lime-sulfur, or manganese ethylene bis dithiocarbamate were also used in some of the cover sprays. In the first test some of the fruit was held in cold storage for four days and then at room temperature for three days, while some was held at room temperature for five days before the counts on brown rot control were made. When the fruit was held in cold storage for four days and then brought out into the packing shed for three days, no rot developed on fruit receiving one application of either Phygon or lime sulfur in bloom and either seven or six applications of wettable sulfur following bloom. The poorest control developed where Puratized was used once in bloom and wettable sulfur was used in the first cover and Cr. 305 was used in the next six applications. When the fruit was held for five days at room temperature, the same general differences were noted but, of course, relatively more rot developed because of the differences in temperature.

The second test, conducted in another block of trees, was quite similar to the first. In this test Zerlate, Parzate, Dithane Z78, wettable sulfur, and liquid lime-sulfur were used in the cover applications in various sequences. Liquid lime-sulfur, Phygon, and Puratized Agricultural Spray were used on the bloom sprays either at pink or at full bloom. One lot of the harvested fruit was held at room temperature for six days and one lot was held at cold storage for five days followed by room temperature for four days. With the lot of fruit held at room temperature for six days the best control of brown rot developed on those fruits harvested from the trees that received no bloom sprays but were sprayed with wettable sulfur in the seven cover applications. The poorest control among the sprayed plots developed where lime-sulfur was applied at the pink stage and this was followed by seven applications of wettable sulfur. With the fruit held at cold storage

followed by room temperatures, the best control was found where lime-sulfur was applied at full bloom and seven cover applications were made, while the poorest control followed the use of Phygon XL at full bloom and one application of wettable sulfur at shuck-off and six applications of Parzate. There is a great deal of conflicting data in these experiments but generally speaking the use of liquid lime-sulfur at bloom and wettable sulfurs at shuck-off and covers is indicated as a good program for brown rot control during the growing season.

In Delaware one pre-harvest test was developed for the control of brown rot. The trees received from two to five applications, according to variety, prior to picking. Liquid lime-sulfur, wettable sulfur, Clorox, Isothan Q15, Parzate, Z78, Phygon XL, Cr. 305, H 258 M, manganese ethylene bis dithiocarbamate, Bioquin + Sulforon x, and Bordeaux-Sulforon x were used. None of these materials had any influence on cutting down the rot at the packing shed. Isothan Q15 and H 258-M defoliated the trees following one application. None of the others appeared to cause any injury.

In a test designed to find out whether brown rot control could be obtained after harvest, packaged peaches were dipped in various suspensions and solutions of fungicides in one Delaware test. Liquid Chlorax, powdered Chlorax, Clorox, calcium chloride, copper sulfate, nitrogen trichloride, Actidione, manganese ethylene bis dithiocarbamate, liquid lime-sulfur, liquid lime-sulfur + Sulforon x, liquid lime-sulfur + Clorox, liquid lime-sulfur + calcium chloride, and liquid lime-sulfur + copper sulfate were used. The best control developed in the tests with liquid lime-sulfur. All of the other materials were inferior to lime-sulfur as far as control was concerned. In addition, Actidione, nitrogen trichloride, powdered Chlorax, and lime-sulfur + Chlorax were found to be less safe than lime-sulfur to the treated fruits. Actidione (5-20 p.p.m.) was very injurious to the treated fruit.

An experiment on brown rot described from the Ontario station, near St. Catherines, in which Micro-sulfur, Magnetic sulfur paste, Cr. 305, Phygon XL + $MgSO_4$ and Esso SR-406 were compared at pink, shuck, and two covers, produced no data relative to control since rot was not a factor. The cooperator reported that there was a possibility that the fruit sprayed with the organics may have been reduced in size.

POWDERY MILDEW

One report from California described the use of Arathane W and lime-sulfur for the control of this disease. Lime-sulfur solution at 1.5% was very effective in reducing the number of shoots showing the systemic infection but too much injury followed its use. Arathane, on the other hand, although not quite as effective as lime sulfur, caused no injury. This is another indication that Arathane may be quite useful in controlling this type of disease. In another test conducted at the Puyallup, Washington station a polysulfide compound, Roccal, Fermate, Puratized Agricultural Spray, Phygon, Bordeaux mixture, and 341C were compared. The polysulfide compound caused a serious twig injury. The best control followed the use of Roccal 10%, 8 quarts to 100 gallons, and Puratized Agricultural Spray at 2 quarts to 100 gallons. Fermate and Bordeaux were next best, while Phygon and the lower concentrations of Roccal and Puratized Agricultural

Spray were inferior. The polysulfide, a mixture of sodium polysulfide and thiosulfate failed to have any influence on the disease. All of the materials, applied at dormant in two applications, with the exception of the sulfide, were found to be safe.

BLIGHT

One report was received from British Columbia concerning this disease. Applications of Fermate were made in September and again at the pink stage of bloom. In the dormant stage two applications of lime-sulfur were made in March and April. No figures were given on disease control but the cooperator reported that considerable dieback developed among the shoots of the above treated trees, while none was observed in adjacent trees receiving only the dormant sprays. Commercial growers who used Fermate in the September sprays but no dormant lime-sulfur reported that their peach trees also developed dieback. The winter was extremely cold in this area last year and possibly the Fermate had prevented the wood from becoming hardy before the cold weather arrived.

BACTERIAL LEAF SPOT

Bacterial leaf spot tests reports were received from Georgia, New Jersey, and South Carolina. One report from New Jersey described the use of zinc-lime, zinc oxide, zinc sulfide, neutral zinc sulfate, basic zinc sulfate, and Esso SR-406 in a day and a night test to control this disease. Considerable spot developed in all the trees. None of the materials proved to be effective in the night applications. In the day applications zinc-lime (tank mixed) again proved to be the best material to use for a partial control of this disease. No injury developed this season from any of the materials used.

In South Carolina reports were received from the Gilbert and Johnston areas. At the Gilbert station zinc-lime and Esso SR-406 were applied in a series of three rapid applications in a ten-day period, just as the leaves were breaking out. A mist blower employing 4x concentrates was used to apply the materials in a day versus night operation. Very little bacterial leaf spot developed in the region due to the dry, cold conditions that prevailed in the early season and no valid comparison of the treatments could be made. It was found that a very good coverage resulted when such an apparatus was used and that the amount of spray material generally used could be cut in half to maintain a very good residue. No injury resulted from any of the materials used.

In the experiment reported on from the Johnston, South Carolina area the test was set up so that spring and summer treatments were superimposed on fall treatments and these were compared with plots treated in the spring and summer. As at Gilbert, very little leaf spot developed due to the dry, cold weather in the early spring. Bordeaux mixture, zinc-lime, Tennessee Copper 26, and lime were used in the fall dormant applications to see if any suppression of bacterial infection was possible at that time. Zinc-lime, Woolfolk Peach Pan, Niagara Peach Spray, Nu-Z, and Delmo-Z were compared in the spring and summer treatments. One application was made in the dormant series and generally six applications were made in the spring-early summer series. The differences in control, or lack of control,

between the various plots were not significant and nothing was gained from the tests.

In the Georgia tests Z.A.C., Bordeaux mixture, lime-sulfur, wettable sulfur, basic zinc sulfate, acid zinc sulfate, and Phygon were compared. Four weekly applications were made during a long blooming period. Some control was evident in the plots sprayed with the basic zinc sulfate. This was thought to be correlated with the better vigor produced in the trees sprayed with this material.

APRICOTS

BROWN ROT

In this test in California, Fermate and Phygon were applied as sprays at full bloom and at petal fall stages of blossom growth to control blossom and twig blight. Phygon gave the best control but Fermate was the safest.

RASPBERRY

YELLOW RUST

Oregon reports that lime-sulfur, Cop-O-Zink, Phygon, Zerlate, and Fermate were applied in a single application at delayed dormant in one test near Corvallis. All of the materials appeared, under the conditions of the test, to be equally efficient and equally safe. Preference was made for lime-sulfur because of its low cost and availability.

ANTHRACNOSE

In a New York test Zerlate, Fermate, Bordeaux mixture, Tennessee Copper-26, C.O.C.S., Puratized Agricultural Spray, and Puraturf 177 were compared. These materials were applied when the new canes were 10-15 inches high and also at prebloom. The mercury compounds were only applied when the canes were 10-15 inches high. The best control was obtained from the use of Zerlate and Fermate. They were also found to be the safest.

STRAWBERRY

RED STELE

In Colorado, soil drenching with suspensions of Dithane Z-78, Parzate, and copper sulfate were compared as to control of the Phytopthora organism in the soil. Apparently all of the materials proved to be of some value since all the treated plots show a degree of control. The plots treated with Dithane Z-78 showed the least injury to plants and also the best yield.

AVOCADO

DOTHIORELLA ROT

In California experiments were conducted to control Dothiorella rot. Bioquin 1, Dithane D 14, and Phygon XL + magnesium sulfate were compared. Bioquin was used in two plots; using one application in late September in one, and two applications in the other on September 20 and November 5. Dithane D 14 was applied in two similar applications but instead of using a conventional hydraulic rig, the material was fogged on with a special machine. The application of Phygon XL-$MgSO_4$ was made with the conventional rig on September 20 and November 5. Bioquin 1 was the only one which gave control and also proved to be the safest of the three. The two applications of Bioquin 1 proved superior in control to that of the one application.

CITRUS

LEMON BROWN ROT

Experiments reported on in 1948 were again repeated in 1949 at the Riverside Experiment station. A number of chemicals were used and the best control of this disease resulted from the use of Ferric Dithane, followed closely by the chromates (Crag) 169, 531, 640, and 658. Arathane, Phygon, and Bordeaux mixture were also very effective. The poorest control developed where Rosinamine D silver nitrate was used.

ALMOND

BROWN ROT

California reported one test on this disease. Bordeaux mixture, Fermate, Zerlate, Phygon XL paste, Puratized Agricultural Spray, Arathane, General Chemical 692 + General Chemical 308, Crag 341C, Crag 531, and Crag 640 were used to control the disease. One application was made at the pop-corn stage of bloom. None of the materials caused any injury. The best control developed in the plots sprayed with Bordeaux mixture and Crag 640. Phygon XL paste and Puratized Agricultural Spray came next, Arathane was next, followed by the dithiocarbamates. The dithioacetates and Crag 341C were the poorest.

GRAPE

BLACK ROT

One test was reported on from Missouri. The early season was dry but rains were frequent and the humidity was high during the summer. Primary infection was light but secondary fruit rot was serious. Fermate, Dithane D 14 + zinc-sulfate, Arathane W, Cr. 305, Esso SR-406, and Bordeaux mixture were used for comparison. The best control followed the use of the dithiocarbamates and Esso SR-406 at 4 pounds to 100 gallons. The poorest control

followed the use of Esso SR-406 at 2 pounds per 100 gallons, Cr. 305, and Arathane W in that order. The safest was Fermate while the most injurious was found to be Bordeaux mixture.

PECAN

SCAB

In Georgia, Bordeaux mixture, Zerlate, Bordeaux mixture first two applications followed by Zerlate in three applications, and Phygon were compared as to control of pecan scab. The best treatment appears to be the split applications of Bordeaux mixture followed by Zerlate. This gives good control, fewer black aphids, and cuts down the amount of injury usually associated with applications of late Bordeaux mixture. Zerlate has been found to cause irritation to the skin of some of the spray operators.

WALNUTS

BACTERIOSIS

In Oregon Bordeaux mixture, yellow Cuprocide, Compound A, Crag Potato fungicide 658, and Tag HL331 were compared as to their control of walnut blight or bacteriosis. Bordeaux mixture proved to be the best bactericide but caused the greatest injury. Compound A, although not so effective as Bordeaux or Yellow Cuprocide, proved to be the safest under the conditions existing this year. The Crag fungicides proved to be inferior to the others in control. Three applications were made: early prebloom, late prebloom, and early postbloom.

DATES

FRUIT SPOILAGE

One report from California states that Thiomate "19", a mixture of Fermate 3.41%, sulfur 92%, and inactive ingredients 4.59%, applied as a dust has proved the most effective, least expensive, and most easily applied fungicide so far found for controlling fruit spoilage.

CRANBERRY

FRUIT ROT

Cranberry rot tests were conducted at the East Wareham, Massachusetts experiment station. Fermate dust, 50-50 with talc, at the rate of 50 pounds per acre, Fermate spray 2-100, 10-4-100 Bordeaux mixture, and copper-zinc-chromate 2-100 at the rate of 250-300 gallons per acre were used to control rots at early bloom and at the end of bloom. The dust was used on wet vines and gave the best control followed by Fermate spray and Bordeaux mixture. The Chromate compound was found to be ineffective in rot control.

EFFECTIVENESS OF MATERIALS ON FRUITS

ARATHANE (dinitrocapryl crotonate). This was good in Washington and British Columbia for controlling powdery mildew of apples. Also good for powdery mildew of peaches. It was very poor and caused some injury when used to control brown rot spur blight of cherries. Also poor for black rot of grapes. It was fair for brown rot of lemons and brown rot of almonds.

ACTIDIONE. No good for controlling apple scab or powdery mildew and also caused injury. Very injurious to peaches and gave inferior brown rot control.

BIOQUIN 1. Little interest and not tested.

GR 305. Looks promising for control of apple scab and possibly apple mildew but only fair for grape black rot. It was unsafe on cherries.

CRAG 341C. Very good control of brown rot spur blight of cherries but seemed to prevent fruit from coloring up properly when used for leaf-spot control. Fair for lemon brown rot and apple scab, and inferior for apple mildew and walnut bacteriosis.

CRAG 658. Promising for lemon brown rot but not so good as Dithane. Also good for almond brown rot.

DITHIOCARBAMATES. Ferbam fair for apple scab but not effective in South Atlantic States. Very safe on apples. Very good for fruit spot, fly speck, bitter rot, rust, and apple black rot (not of fruit, however), but no good for mildew. Good for cherry leaf spot but not brown rot spur blight. Not so good as Phygon for apricot brown rot but safer. Zerlate and Fermate both very good for rust and anthracnose of raspberry. DITHIO-CARBAMATES best for grape black rot and fair for almond brown rot. For some reason the Dithanes were not tested extensively the past season on fruits.

ELGETOL. One of the newest developments in apple scab control was the report of Goldsworthy and Dunegan on use of Elgetol as a ground spray followed by use of TAG 331 at late calyx period.

G.C. 308 and 629. Were reported only in a test for almond brown rot control and gave poor results.

PHYGON. Still a good fungicide but causes too much injury. Phygon dust looks very good for apple scab control but no good for apple mildew. Phygon XL unsafe on cherries. Good control of apricot brown rot but too much injury. Good control of raspberry rust and non-injurious. Also effective for lemon brown rot.

PURATIZED APPLE SPRAY)
PURATIZED AGRICULTURAL SPRAY). Very good control of cherry brown rot spur blight with Agricultural Spray. Good control of apple scab with this

and fair with the Apple Spray. Ineffective for raspberry anthracnose.

SR 406. Good for apple fruit spot but not too good for apple mildew or bacterial leaf spot of peaches.

TAG HL331. Good with apple scab but no good for apple mildew.

RESULTS WITH VEGETABLE DISEASES

POTATOES

NO DISEASE PRESENT

NEW JERSEY (Cranbury). Descending order of yield for sprays was: Dithane D-14, Parzate Liquid, Tribasic, Cop-O-Zink, Dithane Z-78, SR406, Crag 658, and Bordeaux. For dusts it was: Cop-O-Zink, Tribasic, Crag 658, and Dithane Z-78.

WASHINGTON (Mt. Vernon). No yield differences given -- disease absent.

PENNSYLVANIA (State College). In descending order of yield: Crag 658, Bordeaux, Dithane D-14, Cop-O-Zink, Phelps Dodge Cu, and Tribasic.

SOUTH CAROLINA (Charleston). No disease and no differences in yield or control.

LATE BLIGHT

ALABAMA (Gulf Coast Substation). Descending order of control was: COC-S, Crag 658, Dithane D-14, Dithane Z-78, Tribasic, and Phygon XL all alike, a weaker Dithane Z-78 defintely poorer, and the untreated check. In descending order of yield: Phygon XL, Dithane Z-78 (6%), Tribasic, Dithane D-14, Crag 658, COC-S, Dithane Z-78 (3.9%), check.

NOVA SCOTIA (Kentville). In descending order of disease control: Bordeaux, COC-S, Basicop, Perenox, and Dithane all ranked alike, DDT check poorest. In descending order of yield: COC-S best, followed by Bordeaux, Basicop, Perenox, and Dithane all ranked alike, and DDT check lowest.

FLORIDA (Homestead). In descending order of disease control Dithane D-14, Crag 658, SR406, Tribasic, and Cop-O-Zink all ranked alike, manganese ethylene bis dithiocarbamate and Dithane Z-78 alike, Parzate, and Cr305. In descending order of yield: Dithane Z-78 highest, all others alike except Tribasic which ranked lowest.

P.E.I. (Charlottetown). Standard materials in descending order of disease control: Bordeaux, Basicop, COC-S, Perenox, Dithane D-14, and Parzate. In descending order of yield: Bordeaux, Parzate, COC-S, Basciop, Perenox, and Dithane D-14. New materials, in descending order of disease control: Bordeaux, Cop-O-Zink, and Crag 658 alike, SR-406 and Phygon XL alike, and Zac poorest. In descending order of yield, Cop-O-Zink and Crag 658 alike, SR-406, Zac, Bordeaux, and Phygon XL.

EARLY BLIGHT

DELAWARE (Selbyville). In descending order of disease control: Manganese ethylene bis dithiocarbamate, Parzate fungicide, Dithane Z-78, and Dithane D-14 all ranked alike; Crag 658; Tribasic, Robertson Copper, and Parzate-Bordeaux schedule alike; Bordeaux, Copper A, Cop-O-Zink, Cuprocide Y, and Zac alike; Phelps Dodge Copper and Zerlate alike; and untreated check poorest. In descending order of yield: Dithane Z-78,

Zac, manganese ethylene bis dithiocarbamate, Dithane D-14, and Parzate Liquid all alike; Cop-O-Zink; Cuprocide Y and split schedule of Parzate-Bordeaux; Tribasic, Robertson Copper, Crag 658, Zerlate, and Parzate fungicide alike; Bordeaux, Copper A, and check alike; and Phelps Dodge Copper lowest.

MICHIGAN (Lake City). In descending order of disease control: Dithane D-14, 308, Bordeaux, Crag 658, Cop-O-Zink, Dow 926, Parzate, 1124, 1189, Tribasic and EM25-3. In descending order of yield: Dithane D-14, 308, Dow 926, Crag 658, Bordeaux, Cop-O-Zink, 1189, 1124, Parzate, Tribasic, and EM25-3.

NORTH DAKOTA (Northwood). In descending order of disease control: Parzate dust, Parzate spray, Cop-O-Zink spray, 1189 spray, Zinc nitro-dithioacetate spray, Cop-O-Zink dust, Dithane Z-78 dust, Tribasic spray, Robertson Copper dust, Tribasic dust, and untreated check. In descending order of yield: Parzate dust, 1189 spray, Cop-O-Zink spray, Parzate spray, Dithane dust, Cop-O-Zink dust, Tribasic spray, Tribasic dust, Robertson Copper dust, zinc nitro-dithioacetate spray, and the untreated check.

MINNESOTA (Crookston). In descending order of yield (differences not significant): Untreated check, Crag 658 dust, Parzate fungicide dust, Bordeaux spray, Parzate liquid spray, Tribasic dust, Tribasic spray, Cop-O-Zink dust, untreated check, Dithane Z-78 spray, Copper-Lime dust, Dithane Z-78 dust, Crag 658 spray, and Cop-O-Zink spray.

OHIO (Apple Creek). In descending order of disease control: Dithane Z-78, Parzate fungicide, Cop-O-Zink, Zac and Parzate liquid, COC-S, Dithane D-14, Crag 658 and Robertson Copper, Zerlate, Tribasic, Methasan, check. In descending order of yield: Parzate fungicide, Zac, Dithane Z-78, Cop-O-Zink and Parzate Liquid, Dithane D-14 and Tribasic, Zerlate, COC-S, Methasan and Robertson Copper, Crag 658, and check.

OHIO (Marietta). In descending order of disease control: Dithane D-14, Parzate liquid, Parzate fungicide, Dithane Z-78, Cop-O-Zink, Methasan, COC-S, Robertson Copper, Zerlate, Crag 658, Zac, Tribasic, and check. In order of descending yield: Methasan, Robertson Copper, Dithane D-14, Parzate fungicide, Zac, Parzate liquid, Zerlate, Crag 658, Cop-O-Zink, Dithane Z-78, COC-S, Tribasic, and check.

OHIO (Willard). In descending order of disease control: Dithane D-14; Dithane Z-78, Crag 658, and Parzate liquid all alike; Parzate fungicide; Methasan; Tribasic; COC-S; Zac, Zerlate, and Robertson Copper alike; untreated check. In descending order of yield: Parzate fungicide, Dithane D-14, Dithane Z-78 and Parzate liquid alike, Zerlate, Zac, Methasan, COC-S, Tribasic, Robertson Copper, Cop-O-Zink, Crag 658, and check.

OHIO (Wooster). In descending order of disease control: Dithane Z-78; Dithane D-14, Parzate, and Parzate liquid all alike; Crag 658; Zac; Cop-O-Zink; Tribasic, and Methasan alike; Robertson Copper and COC-S alike; Zerlate, and check. In descending order of yield: Dithane Z-78, Parzate liquid, Parzate fungicide, Dithane D-14, Methasan, Crag 658, Zac and Cop-O-Zink alike, Zerlate, Tribasic and Robertson Copper alike, and check.

OHIO (Average of 4 locations). In descending order of disease control: Dithane D-14, and Parzate fungicide alike; Dithane Z-78; Parzate liquid; Cop-O-Zink; Crag 658; Zac; Methasan; COC-S; Robertson Copper; Zerlate; Tribasic; and check. In descending order of yield: Dithane D-14 and Parzate fungicide alike; Dithane Z-78, Parzate liquid; Zac; Methasan; Zerlate; Cop-O-Zink; Robertson Copper; COC-S and Tribasic alike; and check.

TOMATO

EARLY BLIGHT

ALABAMA (Fairhope and Tallassee). Control in descending order was: (1) Dithane Z-78 (10% dust); (2) Dithane Z-78 (5% dust); Dithane D-14; (3) Tribasic (6% dust). Tribasic gave best results at Fairhope and Z-78 (10%) at Tallassee. Overall preference was: (1) Dithane Z-78 (10%); (2) Dithane Z-78 (5%); (3) Tribasic (6%); (4) Dithane D-14 (decreased yield on spring tomatoes at Fairhope). Conditions not favorable to dusting in June and July because of frequent rains.

DELAWARE (Wyoming). Control in descending order was: (1) Zerlate-Parzate mix (1-1), Dithane Z-78-Bordeaux split schedule (3-2), Parzate-Bordeaux split schedule (3-2), Bordeaux, all given equal rank; (2) Parzate, Dithane Z-78; (3) Zerlate, Zerlate-Bordeaux split schedule (3-2), Parzate-Tribasic alternating schedule; (4) Tribasic, Zerlate-Tribasic alternating; (5) untreated. Bordeaux and fixed copper somewhat more injurious than other materials but less so than in previous years. Descending order of yields: (1) Parzate-Bordeaux, Dithane Z-78-Bordeaux, Zerlate-Bordeaux, Tribasic, all of equal rank; (2) Zerlate, Zerlate-Tribasic alternating, Parzate-Tribasic alternating schedule; (3) Parzate, Dithane Z-78, Parzate-Bordeaux. Overall preference: (1) Dithane Z-78-Bordeaux; Zerlate-Parzate mix; (2) Parzate, Dithane Z-78, Zerlate-Bordeaux, Parzate-Bordeaux. Season hot and dry.

ILLINOIS (Urbana). Descending order of control was: (1) Dithane Z-78; (2) manganese ethylene bisdithiocarbamate; (3) Zerlate-Tribasic mix (1-2); (4) Zerlate-Tribasic alternating; (5) Cop-O-Zink; (6) Methasan paste; (7) Tribasic; (8) Zerlate; (9) Bioquin plus Wettable Sulfur (1/4 + 3). Cooperator states that this last combination did not do as well as in 1948. Thought to be due to method of mixing. In 1948 slurries of each were prepared before putting in spray tank while in 1949 the two materials were shaken slowly into tank with agitator running. No apparent injury from any fungicide. Descending order of yield: (1) Zerlate-Tribasic mix; (2) Mn ethylene bisdithiocarbamate; (3) Dithane Z-78; (4) Methasan; (5) Zerlate-Tribasic alternating; (6) Zerlate; (7) Cop-O-Zink; (8) Bioquin 1 - Wettable Sulfur mix; (9) Tribasic. Overall preference: (1) Dithane Z-78, Zerlate-Tribasic mix; (2) Methasan paste, Mn ethylene bisdithiocarbamate, Zerlate-Tribasic alternating.

MARYLAND (Hurlock). Descending order of control was: (1) Zerlate-Tribasic alternating; (2) Copper oxide (Robertson); (3) Parzate, Bordeaux; (4) Dithane Z-78, Zerlate-Tribasic mix, Dithane Z-78-Bordeaux split schedule (2-3); (5) Zerlate-Tribasic split schedule (2-3), Copper 8-sulfur mix; (6) Tribasic, Cop-O-Zink. Descending order of plant safety: (1) Zerlate-Tribasic split schedule, Zerlate-Tribasic alternating, Zerlate-Tribasic mix, Copper 8-sulfur mix; (2) Tribasic, Dithane Z-78, Cop-O-Zink; (3) Bordeaux, Zerlate-Bordeaux split schedule; (4) Parzate. Descending order of yield: (1) Zerlate-Tribasic mix, Copper 8-sulfur mix; (2) Dithane Z-78, Bordeaux, Zerlate-Tribasic split schedule, Zerlate-Tribasic alternating, Zerlate-Bordeaux split schedule, Cop-O-Zink; (3) Tribasic, Parzate. Overall preference: (1) Zerlate-Tribasic split schedule, Zerlate-Tribasic alternating, Zerlate-Tribasic tank mix, Zerlate-Bordeaux split schedule; (2) Tribasic,

Dithane Z-78, Cop-O-Zink. Every application was followed by rain within 24 hours.

NORTH DAKOTA (Fargo). No disease in plots. Descending order of yield was: (1) Cuprocide, Cop-O-Zink; (2)Zerlate, Tribasic; (3) Dithane Z-78, Phygon. Phygon showed somewhat more plant injury than other materials tested. Overall preference Zerlate and possibly Cop-O-Zink.

TEXAS (Jacksonville). Owing to severe drought there was almost no damage from leaf or fruit diseases. Materials used were all applied as dusts and none appeared to cause visible injury to the plants. Descending order of yields was: (1) Rotenone .25% + piperonyl cyclonene .5% + pyrethrins .05%; (2) Methoxyclor-Copper A mixture; (3) White Diamond 63 X tomato dust; (4) Rogers C-D tomato dust; (5) Alltox-K Dust No. 10-63. Differences were slight in 1, 2, and 3. Yields with Alltox-K Dust No. 10-63 were slightly better than the untreated check. No explanation of the increased yields was given.

EARLY BLIGHT AND LATE BLIGHT

VIRGINIA (Blacksburg). Materials applied as dusts. Rainfall heavy and frequent and late blight severe. Twelve applications of dusts were made whereas 6 to 8 usually are sufficient in season of normal rainfall. "All fungicides were effective in reducing the disease incidence and none caused injury to the plants or fruit." Descending order of yields was: (1) Parzate (20%); (2) Parzate (65%); (3) Robertson's Copper Fungicidal Dust; (4) Parzate (65%); (5) Tribasic. Overall preferences: (1) Parzate 20%, Robertson's Copper Dust; (2) Parzate (65%), Tribasic.

EARLY BLIGHT AND SEPTORIA LEAF SPOT

HAWAII (Maui). Descending order of control was: (1) Zerlate; (2) Dithane D-14-$ZnSO_4$ and lime; (3) Tribasic; (4) Parzate; (5) Yellow Cuprocide. Descending order of plant safety: (1) Zerlate, Parzate, Tribasic; (2) Yellow Cuprocide; (3) Dithane D-14. Descending order of yield: (1) Tribasic; (2) Zerlate, Parzate; (3) Dithane D-14. Overall preference: (1) Tribasic; (2) Zerlate; (3) Parzate.

ANTHRACNOSE

NEW JERSEY (New Brunswick). Season very dry and disease not severe. Materials tested were Tribasic, Bioquin, Crag 658, Phygon XL, Dithane D-14, Dithane Z-78, Parzate, Zerlate-Tribasic split schedule, Zerlate-Tribasic mix (1-2), Zerlate-Parzate mix (1-1), and Dithane Z-78-Bordeaux split schedule. No change in preference as result of this test. No significant difference in control by various fungicides. Disease in treated plots ranged from 1.3 to 7.5 percent with 6 to 9 percent in untreated plots. No evidence of plant injury and no significant differences in yield.

ILLINOIS (Urbana). Descending order of control was: (1) Methasan; (2) manganese ethylene bisdithiocarbamate; (3) Zerlate; (4) Dithane Z-78; (5) Zerlate-Tribasic alternating; (6) Zerlate-Tribasic (1-2) mix; (7) Tribasic; (8) Cop-O-Zink; (9) Bioquin-Wettable Sulfur mix. No evidence of

injury from any treatment. Descending order of yield: (1) Zerlate-Tribasic mix; (2) Mn-ethylene bisdithiocarbamate; (3) Dithane Z-78; (4) Methasan; (5) Zerlate-Tribasic alternating; (6) Zerlate; (7) Cop-O-Zink; (8) Bioquin 1-Wettable Sulfur mix; (9) Tribasic. Overall preference: (1) Dithane Z-78, Zerlate-Tribasic; (2) Methasan, Mn-ethylene bisdithiocarbamate, Zerlate-Tribasic; (3) Zerlate. (See comments under report on early blight).

NEW YORK (Geneva). In disease control the following treatments were grouped as the most effective: Zerlate-Bordeaux alternating, Zerlate plus Ortho K-Bordeaux alternating, Zerlate-Tribasic alternating, Zerlate-Parzate tank mix, Zerlate plus Ortho K-Parzate mix. The following treatments were inferior in disease control: Zerlate, Zerlate plus Ortho K, Methasan, Methasan plus Ortho K, Zerlate-Dithane Z-78 mix plus Ortho K, Dithane Z-78, Dithane Z-78 plus Ortho K, Dithane D-14 with $ZnSO_4$. No plant injury occurred with fungicides listed as most effective. Yield differences not significant. Overall preference: (1) Zerlate plus Ortho K-Bordeaux alternating; (2) Zerlate-Bordeaux alternating; (3) Zerlate-Tribasic mix; (4) Zerlate-Parzate mix, Zerlate-Parzate mix plus Ortho K. Season very dry and anthracnose only disease occurring to a measurable extent.

OHIO (Wooster). Descending order of anthracnose control by fungicides applied as sprays: (1) Mn ethylene bisdithiocarbamate; (2) Parzate + Mn ethylene bisdithiocarbamate; (3) Parzate; (4) Zerlate + Parzate; (5) Zerlate-Tribasic alternating; (6) Fungicide C; (7) Zerlate + p.e.p.s.; (8) Zerlate; (9) Zac S; (10) Zerlate + Florigel; (11) Methasan Bonded; (12) Dithane + $ZnSO_4$; (13) Dithane Z-78; (14) Methasan S; (15) Zerlate + F 529; (16) 5379, Fermate; (17) Zac S + Latex; (18) Crag 658; (19) Zac S + p.e.p.s.; (20) Calcium ethylene bisdithiocarbamate; (21) Zerlate + AS50; (22) Fac S; (23) COC-S; (24) Penn 492; Zerlate + Parzate alternating; (25) Zerlate + Latex; (26) Dithane Bonded; (27) Methasan; (28) 829B5G; (29) Parzate + $ZnSO_4$; (30) Tribasic, Robertson Copper; (31) 658B5G; (32) Esminel N; (33) Cop-O-Zink.

In this experiment soil around the plants was artificially contaminated with the causal organism of anthracnose fruit rot. Rot was severe and many treatments failed to give satisfactory control. Cooperator's note: "Even Zerlate, which can usually be depended upon to give between 75 and 80 percent control, did not reduce the rot by more than 60 percent. This was one of the few instances in the author's experience where Parzate (dry form) seemed to check anthracnose better than Zerlate, and a combination of Parzate and manganese ethylene bis dithiocarbamate gave very good results, although the latter material used alone did even better. Zerlate plus Parzate was also fairly effective. Cop-O-Zink, Esminel, Tribasic, some of the copper-zinc-chromate formulations, Fac S, and Robertson Copper gave comparatively poor control of this disease. Net yields were high with most of the Zerlate formulations, 'Manganese bis' and the alternating schedule of Tribasic and Zerlate. On the other hand, they (net yields) were somewhat low with most of the Dithane formulations, the Methasans and chromates, as well as the untreated checks. Some of these treatments that produced comparatively low yields gave better than average control of early blight -- which indicates that anthracnose was probably more important in determining the net yields of usable fruit than was defoliation

by early blight in this experiment. The fixed-copper plots rather generally had more green fruits remaining on the vines at the end of the picking season than did most of the organics, with the exception of 'manganese bis'."

Another series of treatments was sprayed on Rutgers plants at Wooster. Anthracnose was comparatively mild and defoliation from early blight did not affect yields until mid-September. Cooperator's note: "Anthracnose was best controlled by Zac, several Methasan formulations, Parzate, and Parzate plus 'Manganese bis'. It was comparatively severe on most of the fixed-copper and the copper-zinc-chromate plots, as is usually the case. 'Calcium bis' and Oilcop also gave little control of anthracnose. Early blight, as indicated by the percentage of defoliation, was best controlled by the fixed coppers and such materials as Dithane and Parzate. The percentage of culls was comparatively high with most of the copper-containing compounds, usually because of poor anthracnose control, but the average was slightly lower with the 'organics'. P.e.p.s. was used with six different fungicides in this experiment and brought about very little change in the various criteria used to indicate performance of the various treatments. Gross and net yields were slightly lower when p.e.p.s. was used. The percentage of culls and of fruits affected with anthracnose were lower (indicating slightly better disease control). The degree of defoliation was similar with or without p.e.p.s. but the green fruit yields were also slightly lower with p.e.p.s."

Several fungicides were applied as dusts to Rutgers tomatoes at Wooster. Descending order of anthracnose control was: (1) Methasan-Talc; (2) Zerlate-Talc; (3) Zac-Talc; (4) Dithane-Talc; (5) Tribasic-Talc; (6) untreated; (7) Parzate-Talc; (8) COC-S-Talc; (9) Crag 658. Cooperator's note: "Methasan gave the best control of the light infection of anthracnose which occurred, and also the lowest percentage of culls and the largest net yield. Crag 658 gave comparatively poor control of anthracnose but a good net yield. COC-S was also high in anthracnose but gave good control of early blight and the largest yield of green fruit at the end of the season. Dust formulations of this type have given surprisingly good disease control on tomatoes for the past two years."

OHIO (Fremont). An experiment on the control of anthracnose fruit rot and defoliation diseases was again conducted at Fremont. Late blight was very scarce and early blight and anthracnose were less prevalent than usual. Descending order of anthracnose fruit rot control was: (1) Methasan S; (2) Zerlate; (3) Zac; (4) Zerlate and Parzate alternating; (5) Crag 658, Zerlate-Parzate mix; (6) Parzate; (7) Tribasic; (8) Dithane. Cooperator's note: "Anthracnose was best controlled by Methasan, closely followed by Zerlate and Zac. Methasan and Zerlate were also comparatively low in percentage of culls. Net yields were highest with Dithane, Methasan, and the alternating schedule of Zerlate and Tribasic."

OHIO (Sandusky). This was a planting of Stokesdale tomatoes that produced an excellent crop. Cooperator's note: "Zerlate and Parzate, and an alternating schedule of the two, all were responsible for large gross and net yields. Zac S also did well in this respect. The best control of anthracnose was again furnished by Methasan, closely followed by Zerlate and Zac S. The same treatments were also comparatively low in culls,

although Tribasic gave the best results in this respect, which was somewhat surprising in view of the fact that it did not control anthracnose. However, a type of soil rot which was prevalent during the latter third of the picking season was best checked by Tribasic. The Methasan and Dithane plots showed the best foliage condition in this experiment near the end of a season when early and late blight were practically non-existent."

OHIO (Marietta). Several fungicides and 5 different insecticides were applied to staked tomatoes at Marietta. Yields were very much alike for all treatments. Descending order of early blight control on the basis of defoliation on August 12 was: (1) Tribasic-CS 645; (2) Tribasic-Marlate; COC-S with DDT-A; (3) Tribasic-Parathion; (4) Tribasic-Chlordane, Tribasic-Rhothane; (5) Cop-O-Zink and DDT-A; (6) Parzate-DDT-A; (7) Tribasic-DDT-A; (8) Zac-DDT-A, Robertson Copper-DDT-A; (9) Crag 658-DDT-A; (10) Methasan S-DDT-A; (11) Zerlate-DDT-A. Cooperator's note: "COC-S, of the fungicides, gave the best control of a rather heavy infection of early blight. Dithane, Tribasic and Cop-O-Zink also did well in this respect. Zerlate gave comparatively poor control of early blight, as did Methasan and Crag 658 in this experiment."

Cooperator's summary. "In general the results obtained with various fungicides tested in 1949 (which included most of those now available) indicate that zinc dimethyl dithiocarbamate (ziram) should still be depended upon for anthracnose control, and that a new material (manganese ethylene bis dithiocarbamate) may enter the picture for the control of this disease. The fixed coppers and the zinc ethylene bis dithiocarbamate (zineb) will usually give the best control of early blight (and possibly late blight too when it occurs). Also, there is plenty of evidence that the alternating schedule of ziram with a copper or zineb should still be used for overall disease control on tomatoes."

LATE BLIGHT

NOVA SCOTIA (Kentville). Descending order of control was: (1) Zerlate (1 appl.) followed by Bordeaux (3 appl.); (2) Tribasic, Phygon, Bordeaux (10-7 1/2-100), Bordeaux (7-3 1/2-100), given equal rank; (3) Basicop dust. Descending order of safety: (1) Tribasic, Phygon, Basicop; (2) Zerlate-Bordeaux; (3) Bordeaux (10-7 1/2-100), Bordeaux (7-3 1/2-100). Descending order of yield: (1) Bordeaux (7-3 1/2-100); (2) Untreated; (3) Tribasic; (4) Basicop; (5) Zerlate-Bordeaux; (6) Phygon; (7) Bordeaux (10-7 1/2-100). Overall preference: (1) Zerlate-Bordeaux; (2) Tribasic, Phygon. Severe drought during July and August affected growth and blossom-end rot was prevalent. First late blight appeared in checks October 1. Last spray applied September 14 and trace of late blight found in all plots October 15. At that time checks showed 29.5% blight.

SOUTH CAROLINA (Charleston). Descending order of control was: (1) Tribasic, Cop-O-Zink; (2) Parzate, Dithane Z-78, Copper-zinc-chromate; (3) Zerlate. Cooperator's note: "All except Zerlate gave satisfactory control. The coppers appeared slightly superior to Dithane and Parzate." No injury from any treatment. Descending order of yield: (1) Tribasic, Cop-O-Zink; (2) Parzate, Dithane Z-78, Zerlate, Copper-zinc-chromate. Overall preference: (1) Tribasic; (2) Cop-O-Zink; (3) Parzate, Dithane Z-78, Cn-Zn-chromate. Late blight was severe during period of almost daily

showers from June 1 to 15. Dry weather retarded progress of the disease thereafter but crop was severely damaged.

GRAY LEAF SPOT (Stemphylium solani)

FLORIDA (Homestead, Dade Co.). Season unusually warm and dry. Descending order of control: (1) Dithane Z-78, Dithane D-14-$ZnSO_4$ and lime, Parzate Liquid-$ZnSO_4$ and lime, Dithane D-14-$ZnSO_4$, magnesium ethylene bisdithiocarbamate-$ZnSO_4$; (2) Dithane D-14-$ZnSO_4$ and lime alternated with Phygon XL; (3) Copper A (8 appl.) followed by Dithane D-14-$ZnSO_4$ and lime, Parzate; (4) CR 305, Phygon XL; (5) Copper A; (6) Copotox. Materials not providing commercial control were: Dithane D-14-$ZnSO_4$ and lime alternated with Phygon XL, CR 305, Copper A, Copotox, Phygon XL, and Parzate. All sprays containing zinc ethylene bisdithiocarbamate caused extensive yellowing and mottling after light frost of January 2, 1949, but plants were recovering within 10 days and later growth was normal. No other injury reported. Descending order of yield: (1) Dithane Z-78, Dithane D-14-zinc and lime, Parzate Liquid-$ZnSO_4$; (2) Dithane D-14-$ZnSO_4$ and lime, CR 305, Dithane D-14-$ZnSO_4$, magnesium ethylene bisdithiocarbamate; (3) Copper A followed by Dithane D-14-$ZnSO_4$ and lime, Copper A, Copotox, Phygon XL, Parzate. Overall preference: (1) Dithane Z-78, Dithane D-14-$ZnSO_4$ and lime, Parzate Liquid-$ZnSO_4$ and lime, Mg ethylene bisdithiocarbamate.

LATE BLIGHT AND BACTERIAL SPOT

FLORIDA (Homestead, Dade Co.). Season unusually warm and dry. Descending order of control of bacterial spot on fruit: (1) CuTMTD; (2) SR 406, Phygon XL alternated with Dithane D-14-$ZnSO_4$ and lime, Dithane D-14-$ZnSO_4$ and lime, Dithane D-14-$ZnSO_4$, Parzate Liquid-$ZnSO_4$; (3) Phygon XL, magnesium ethylene bisdithiocarbamate-$ZnSO_4$; (4) untreated; (5) CR 305. All fungicides controlled late blight with no evidence of difference between them. Descending order of yield (marketable fruit): (1) SR 406; (2) Phygon alternated with Dithane D-14-$ZnSO_4$ and lime, Mg ethylene bisdithiocarbamate-$ZnSO_4$, Phygon XL, CuTmTd, Dithane D-14-$ZnSO_4$ and lime; (3) Parzate Liquid-$ZnSO_4$; (4) CR 305. Overall preference: (1) Dithane D-14-$ZnSO_4$ and lime, Dithane D-14-$ZnSO_4$, and Parzate Liquid-$ZnSO_4$.

BUCKEYE ROT (Phytophthora parasitica)

TENNESSEE (Knoxville). Conditions very favorable for development of buckeye rot. Materials tested were: C-O-C-S plus Resyn Adhesive #3605 and Tribasic plus Resyn Adhesive #3605. Both gave good control without evident injury to plants. Yields were satisfactory with both fungicides. No preference indicated.

POLE BEANS (BLUE LAKE)

WHITE MOLD (Sclerotinia sclerotiorum)

OREGON. Descending order of control was: (1) Zerlate dust 10% and Zerlate (1:100) + sulfur (4-100); (2) Flotox; (3) Zerlate (1.5-100) and

Bismuth subsalycilate (1-100) and ditto 6% dust, and Sulforon and C.O.C.S. + Kolodust 20-80; (4) Zerlate 10% dust + sulfur 90% dust and Kolodust. No injury. No yield data. No preference can be stated yet but Zerlate or Zerlate plus sulfur combination show greatest promise.

LIMA BEANS (HENDERSON BUSH)

DOWNY MILDEW

DELAWARE (Bridgeville). Descending order of control: (1) Bordeaux (6-6-100) and Tribasic (3-100) and Parzate dust 6%; (2) Dithane Z-78 (2-100); (3) Parzate (2-100); (4) Dithane Z-78 dust 6% and Tribasic dust 10%; (5) untreated. Descending order of yield: (1) Tribasic dust, (2) Parzate (2-100) and untreated; (3) Tribasic (3-100); (4) Parzate dust; (5) Dithane Z-78 (2-100); (6) Bordeaux 6-6-100; (7) Dithane Z-78 dust. Preference: Tribasic dust 10%. Injury from Bordeaux; slight to moderate injury from Tribasic.

DELAWARE (Milton). Descending order of control: (1) Tribasic dust 10%; (2) Bordeaux (6-6-100); (3) Tribasic (2-100); (4) Parzate dust 6%; (5) Dithane Z-78 (2-100); (6) Parzate (2-100); (7) Dithane Z-78 dust 6%; (8) untreated. Descending order of yield: (1) Dithane Z-78 dust; (2) Tribasic dust; (3) Dithane Z-78; (4) Bordeaux and Parzate dust; (5) Tribasic; (6) Parzate; (7) untreated. Preference: Tribasic dust 10%. Injury from Bordeaux; slight to moderate from Tribasic.

PEPPER

FRUIT ROTS

MARYLAND. Descending order of control: (1) Dithane Z-78 (2-100); (2) Tribasic (4-100); (3) untreated. No injury observed. Order of preference same as above.

PEAS

FUSARIUM WILT

COLORADO. Variety, Early Alaska. Fungicides were applied as dusts on soil along row, worked into soil and watered well; 2 applications, 1 week apart. All used at rate of 2 1/2 lb./100 sq. ft. Descending order of control: (1) Dithane Z-78; (2) Parzate; (3) Zerlate; (4) Spergon (wettable) and Fermate; (5) untreated. Descending order of yield; Dithane Z-78; Zerlate; Parzate; Spergon; Fermate and untreated. Overall preference same as order of control.

CELERY

LATE BLIGHT (Septoria)

OREGON. Variety was Pascal. Appl. schedule 7 day. Descending order of control: (1) Tribasic (4-100), Parzate (1.5-100), Phygon (0.75-100),

Zerlate (1.5-100), Tribasic dust 7%, Parzate dust 10%, Zerlate dust 10%; (2) Actidione (3 ppm). Phygon XL caused stunting and chlorosis; Parzate some chlorosis. Descending order of preference: (1) Tribasic, Zerlate, Tribasic dust, Zerlate dust; (2) Parzate, Parzate dust; (3) Phygon; (4) Actidione.

EARLY BLIGHT (Cercospora)

MICHIGAN. Appl. weekly beginning early July. Season favorable for early blight; unfavorable for late blight. Descending order of control, plant safety, yield and preference: (1) Dithane Z-78 6% + 30% sulfur; (2) Cuprocide 6% + 30% sulfur; (3) Tribasic + 30% sulfur + Nu-Z; (4) Tribasic + 30% sulfur.

OHIO. Appl. schedule 6 day. Descending order of control: (1) Methasan Slurry (3-100); (2) Zerlate (2-100), Tribasic (4-100); (3) Dithane Z-78 (2-100); (4) Parzate (2-100); (5) Cop-O-Zink (4-100); (6) untreated. Descending order of yield, trimmed celery: (1) Methasan slurry, (2) Dithane Z-78, (3) Zerlate, Parzate; (4) Tribasic; (5) Cop-O-Zink (6) untreated.

ONTARIO. Variety, Golden Phenomenal. Appl. schedule 7 day. Descending order of disease control: (1) Bordeaux (4-4-40), Copper oxide (3.5-100), and C.O.C.S. (7.5-100); (2) SR-406 (2-100), CR-305 (2,5-100); (3) Phygon XL (1-100); (4) untreated.

CARROTS

YELLOWS AND LEAF SPOTS

OHIO. Appl. 9 day schedule. Descending order of disease control: (1) Tribasic (4-100); (2) Tribasic + DDT (4-2-100); (3) Crag 658 + DDT (2-2-100); (4) Parzate + DDT (2-2-100); (5) Zerlate + DDT (2-2-100); (6) Dithane Z-78 + DDT (2-2-100); (7) untreated. Descending order of yield; (1) Tribasic; (2) Crag 658; (3) Zerlate + DDT, Parzate + DDT; (4) Dithane Z-78, Tribasic + DDT; (5) untreated.

STORAGE ROTS (Botrytis and Sclerotinia)

IDAHO. Fungicides dusted on roots in storage. Descending order of control: (1) Arasan (15%); (2) Arasan (15%) + Fermate (15%); (3) Fermate (15%); (4) Fermate (100%); (5) untreated; (6) Borax (15%). Borax caused injury. Preference: (1) Fermate (15%); (2) Arasan (15%).

ONION

DOWNY MILDEW

MICHIGAN. Dusting schedule weekly from July 10. No mildew developed in plots. Descending order of yield, plant safety and preference: (1) Dithane Z-78 6% + sulfur 30%; (2) Tribasic 25% + sulfur 30% + nuzinc; (3) Cuprocide 6% + sulfur 30%. Zinc and sulfur stimulated yield.

OREGON. Dusting schedule: after rains, 8 appl., March 19-May 2.

Descending order of control, yield and preference: Test No. 2. (1) Dithane Z-78 (8%) + DDT (3%); (2) Copper (7%) + mineral oil (2%) + DDT (3%). Test No. 1. Following all failed to give disease control under severe conditions of test: Copper (7%) + zinc (1.5%) + DDT (3%); Cuprocide 7% + sulfur 30% + DDT (3%); Copper (7%) + mineral oil (2%) + zinc (1.5%); Copper (7%) + DDT (5%) + celite (2.5%) + diluex (1%).

PURPLE BLOTCH

COLORADO. Spray every 10-14 days. Triton B1956 spreader and Goodrite P.E.P.S. sticker used with both fungicides. No significant difference in control, yield, or preference between Yellow Cuprocide (1.5-100) and Dithane Z-78 (1.5-100). Both good.

GENERAL

OHIO. Sprays on 10-day schedule; all contained DDT for thrips control at rate of 2-100. Descending order of yield: (1) Parzate (2-100); (2) Dithane Z-78 (2-100); (3) Crag 658 (2-100); (4) Zac (2-100); (5) Zerlate (2-100); (6) C.O.C.S. (2-100); (7) untreated.

SPINACH

DOWNY MILDEW

CALIFORNIA. Weekly sprays. Order of control, yield and preference: (1) Dithane Z-78 (1.5-100); (2) Rosin lime-sulfur (1 gal. each-100).

WASHINGTON. Sprays and dusts, 4 appl. at weekly intervals beginning first leaf stage. Descending order control: (1) Spergon dust (6%), Dithane D-14 (2 qt.) + zinc sulfate 1 lb.-100; (2) Phygon dust (2%), Tribasic (4-100); (3) Amm. Copper Carb. (55%) (6 oz.-3 pts.-50); (4) Spergon wettable (3-100), Phygon XL (0.5-100), SW XP 41A 5 ppm; (5) untreated. Descending order of preference: (1) Dithane D-14, Spergon dust; (2) Tribasic; (3) Amm. Copper Carb., Spergon spray, Phygon dust; (4) Phygon XL and SW XP 41A.

CUCUMBER

DOWNY MILDEW

NORTH CAROLINA. Dusted at 10-day intervals and after each rain in excess of 0.25 in. Descending order of yield: (1) Tribasic (5%); (2) Parzate (10%); (3) Dithane Z-78 (10%); (4) Zerlate (10%); (5) untreated. No injury observed. Preferred treatment, Tribasic.

SOUTH CAROLINA. Nine appl. at 7-day intervals on 3 mildew-resistant varieties. Sprays 80-100 gal./A, 800 gal. total; dusts 12-30 lb./A, 170 lb. total. Descending order of control: (1) Dithane Z-78 (1.5-100); (2) Zerlate (2-100), Dithane Z-78 dust (8%); (3) Tribasic (3-100), Cu-Zn-Chromate (2-100), Cop-O-Zink (3-100); (4) Zerlate dust (8%), Tribasic dust (10%), Cu-Zn-Chromate dust (8%), Parzate liquid + Zinc sulfate (2-3/4-100); (6) untreated. No injury from any noted. Descending order of yield:

(1) Dithane Z-78 spray; (2) Dithane Z-78 dust, Zerlate spray; (3) Tribasic, Cu-Zn-Chromate, Zerlate dust; (4) Cop-O-Zink, Tribasic dust; (5) Cu-Zn-Chromate dust, untreated; (6) Cop-O-Zink dust, Parzate dust, Parzate liquid. Sprays preferred to dusts. Overall first choice Dithane Z-78 spray.

DOWNY MILDEW AND ANTHRACNOSE

LOUISIANA. Dust -- ten appl. 4-6 day intervals. Variety Cubit. Descending order of control of downy mildew: (1) Dithane Z-78 (8%), Cop-O-Zink (7%), Tribasic (7%), #658 (8%), SR-406 (8%); (2) Parzate (8%), Fermate (8%). Descending order of control of Anthracnose: (1) Fermate (8%), Dithane Z-78 (8%), Parzate (8%); (2) SR-406 (8%); (3) #658 (8%); (4) Tribasic (7%), Cop-O-Zink (7%). Tribasic and Cop-O-Zink caused slight marginal chlorosis which plants outgrew. Order of preference: (1) Fermate, Dithane Z-78, Parzate; (2) SR-406; (3) #658; (4) Tribasic, Cop-O-Zink.

SCAB (Cladosporium)

MICHIGAN. Var. National Pickling. Sprayed 7 times July 7-September 1 incl. Descending order of control and preference: (1) Actidione (10 ppm); (2) Cu-Zn-Chromate(2-100); (3) Tribasic (3-100); (4) Dithane Z-78 (2-100); (5) Zerlate (2-100) and untreated. Descending order of total (clean, cull, scab) yield: (1) Dithane Z-78; (2) Cu-Zn-Chromate (3) untreated; (4) Zerlate; (5) Actidione; (6) Tribasic. Very slight marginal chlorosis from both copper materials. Zerlate ineffective in scab control.

CANTALOUPE (MUSKMELON)

DOWNY MILDEW AND MACROSPORIUM LEAF SPOT

NEW JERSEY. Sprays -- 3 appl. 9-day intervals. Disease control poor. Descending order of disease control (Downy mildew): (1) Crag 658 (4-100), Tribasic (4-100) M-294 (3-100); (2) Dithane D-14 + zinc sulfate (2 qt.-1-100), Dithane Z-78 (2-100), SR-406 (4-100); (3) SR-406 (2-100), Fermate (2-100), Zerlate (2-100). Inorganic coppers caused yellowing of leaf margins. Preferred materials, Dithane Z-78 and Tribasic.

DELAWARE. Variety - Halis Best Jumbo. Eight appl. July 1-August 18 incl. Descending order of control (Macrosporium): (1) Bordeaux (6-3-100), Yellow Cuprocide (1.5-100), Dithane Z-78 (2-100) 5 appl. followed by Bordeaux (6-3-100) 3 appl.; (2) Tribasic (3-100) Parzate (2-100), Dithane Z-78 (2-100), Dithane D-14 + Zn sulfate (2-1-100), Parzate liquid + Zn sulfate (2-3/4-100), Zerlate-Parzate 1-1 (2-100), Copper A (3.5-100); (3) Tribasic dust (10%) Zerlate dust (10%), Dithane Z-78 dust (6%), Crag 658 (2-100), Copper A dust (10%); (4) Zerlate (2-100), Parzate dust (6%); (5) untreated. Parzate and Dithane caused yellowing and bronzing of foliage; copper sprays caused less injury than in previous years when weather was cooler and wetter. Descending order of yield: (1) Tribasic dust, Zerlate dust, Parzate dust, Dithane Z-78 dust, Dithane D-14, Crag 658, Dithane Z-78-Bordeaux split; (2) Yellow Cuprocide, Tribasic, Zerlate, Parzate, Dithane Z-78, Liquid Parzate, Zerlate-Parzate (1-1), Copper A and Copper A dust; (3) untreated; (4) Bordeaux.

Preferred first choice: Tribasic, Dithane Z-78, Dithane Z-78-Bordeaux split schedule.

MARYLAND. Variety - Halis Best Jumbo. Five appl. July 1-August 12 incl. Descending order of control (Downy mildew and Macrosporium): (1) Bordeaux (6-3-100); (2) Tribasic (4-100); (3) Dithane Z-78 (2-100); (4) Zerlate (2-100). Descending order of plant safety: (1) Zerlate; (2) Dithane Z-78; (3) Tribasic; (4) Bordeaux. Descending order of yield: (1) Tribasic; (2) Bordeaux, Zerlate; (3) Dithane Z-78; (4) untreated. Order of preference: (1) Tribasic; (2) Zerlate; (3) Dithane Z-78; (4) Bordeaux.

SOUTH CAROLINA. Variety - Halis Best Jumbo. Dusted 7 times May 30-June 29 incl. Descending order of control (Downy mildew): (1) Dithane Z-78 (8%); (2) Zerlate (8%); (3) Parzate (8%); (4) Tribasic (10%). Descending order of yield: (1) Zerlate; (2) Dithane Z-78; (3) Parzate; (4) Tribasic. Order of preference: (1) Dithane Z-78, Zerlate; (2) Parzate, Tribasic. None of the fungicides gave adequate protection due to numerous showers. Tribasic caused slight injury early in season.

MICHIGAN. Variety - Purdue 44. Sprayed 7 times July 7-September 1 incl. No disease developed though inoculated with Macrosporium and Colletotrichum 3 times. Marginal yellowing caused by Tribasic and Cu-Zn-Chromate. Injury not reported for Actidione, Dithane Z-78, Zerlate.

WATERMELON

DOWNY MILDEW

FLORIDA. Variety, Cannon Ball. Dusted 10-day interval. Descending order of control: (1) Tribasic (7%); (2) Dithane Z-78 (8%), Zerlate (8%); (3) Parzate (8%); (4) #658 (8%); (5) Tribasic (7%) + bentonite; (6) Copper oxide (8%). Order of plant safety: (1) Dithane Z-78; (2) Tribasic, Zerlate; (3) Parzate, #658. Yield not available. Zerlate increased aphid damage. Parzate caused burning of foliage. Tribasic and #658 gave typical copper burning of foliage, but not serious. Preferred materials: (1) Dithane Z-78; (2) Tribasic.

FLORIDA. Variety, Cannon Ball. Sprayed every 7 days. Descending order of control: (1) Tribasic (4-100); (2) Dithane Z-78 (2-100); (3) Dithane D-14 + Zn sulfate (2-1-100); (4) Parzate (2-100); (5) Parzate liquid + Zn sulfate (2-1-100). Yield not taken. Tribasic burned foliage. Dithane better than Parzate; Dithane Z-78 better than D-14. No injury from Parzate or Parzate liquid. Preferred material: Dithane Z-78.

GUMMY STEM BLIGHT

FLORIDA. Variety, Cannon Ball. Sprayed every 7 days. Descending order of control: (1) Dithane Z-78 (2-100); (2) Dithane D-14 + Zn sulfate (2-1-100); (3) Tribasic (4-100). Latter failed to control disease. Order of plant safety same as above. Preferred fungicide: Dithane Z-78.

VALUE OF THE NEWER FUNGICIDES FOR VEGETABLE DISEASE CONTROL

The excellent performance of the zineb materials on a wide range of vegetable crops was again demonstrated. One or more of them were effective in the control of the following diseases: early and late blights, and anthracnose of tomato; early and late blights of potato; downy mildews of lima beans, onion, spinach, cucumbers, and watermelons; early blight of celery; cucumber anthracnose; pepper fruit rot; Macrosporium leaf spot of cantaloupe; and gummy stem blight of watermelons. Parzate was reported to have caused some chlorosis in celery, burned watermelon foliage, and caused a yellowing and bronzing of cantaloupe foliage.

ACTIDIONE. Good control of cucumber scab in one test.

BIOQUIN 1. Wettable sulfur mixture gave excellent control of early blight in one instance and failed in another trial.

COPPER-ZINC-CHROMATES. Look good for Macrosporium leaf spot of cantaloupe and promising for early and late blights of potatoes, and for cucumber scab. One of them caused a marginal yellowing of cantaloupe foliage.

COP-O-ZINK. Looks promising for downy mildew of cucumber and early and late blights of potato. Caused slight marginal burn on cucumber in one test. On tomatoes it performed unevenly but was quite effective against early and late blight in a few instances.

CR 305. Did not show great promise in a single test against gray leaf spot of tomato but in another test it gave satisfactory control of late blight.

FERMATE. Was good for cucumber anthracnose.

MAGNESIUM ETHYLENE BIS DITHIOCARBAMATE. Proved very effective against potato and tomato early blights and against tomato anthracnose.

MANGANESE ETHYLENE BIS DITHIOCARBAMATE. Was effective against potato and tomato early blights and against tomato anthracnose.

PERENOX. Looked promising in one test on potato late blight.

PHYGON XL. When used alone or in combination with Dithane D-14 did not give outstanding disease control on tomatoes but it was promising in one test on potato late blight. It caused stunting and chlorosis in celery.

ROBERTSON'S COPPER. Seemed to be ineffective against early and late blights of tomatoes and early blight of potatoes but tests were limited.

SPERGON DUST. Looks good for downy mildew of spinach.

ZIRAM. Materials look good for early and late blight of celery and when used alone or in combination with copper fungicides they were effective against tomato anthracnose and early blight. Tank mixtures of Zerlate-Parzate and Zerlate-Tribasic also gave good results on tomatoes where tested. Zerlate was ineffective for cucumber scab and one report from Florida stated that it increased aphid damage on watermelon.

RESULTS WITH ORNAMENTAL CROPS, TURF SHADE TREES AND SHRUBS

AZALEAS

PETAL BLIGHT: ALABAMA. Dithane D-14 + zinc sulfate + lime, Dithane Z-78, Parzate, and Parzate liquid were equally effective. Parzate dust and Dithane Z-78 dust were slightly less effective and had a tendency to be injurious. Crag Potato Fungicide # 658 and Actidione were not effective. Bloomocide was also ineffective and caused necrotic spotting. Reduced concentrations of Dithane D-14-zinc and lime were as effective as the normally recommended concentration, but lower concentrations of Parzate and Dithane Z-78 were less effective. Three applications a week during the flowering period gave the best control, two applications were satisfactory and one application per week was insufficient. There was no injury with Parzate but Dithane D-14, Dithane Z-78, and Parzate liquid resulted in wilting and burning of the flowers when the plants were suffering from a lack of water.

CARNATION

ALTERNARIA LEAFSPOT AND BRANCH ROT: NEW YORK (Farmingdale). Bioquin 1 again gave the best control followed by SR-406, CR-305, Zerlate, Crag Potato Fungicide, Actidione, and Fulex B in that order. B-1956 spreader was used with all materials. Crag Potato Fungicide caused slight injury. Injury with SR-406 was doubtful. Zerlate is recommended because of its lower cost.

FUSARIUM ROOT ROT: COLORADO. Control in descending order of efficacy was as follows: Fulex B, Dithane Z-78, Carbide and Carbon 531, Carbide and Carbon 658, and Goodrite Z.A.C. Ceresan M and Calogreen were not effective. Dithane Z-78 was given over-all preference because there was no plant injury. Ceresan M and Calogreen caused excessive stunting and hardening of the young plants. Flower yields were poor when C & C 531 and C & C 658 were used. Spore suspensions of Trichoderma lignorum gave control about equal to that of Dithane Z-78 but spore suspensions of Aspergillus flavus had no effect.

BACTERIAL LEAF SPOT AND RUST: HAWAII. Five materials were tested. Tribasic copper sulfate and Yellow Cuprocide were effective against bacterial leaf spot but not against rust whereas Zerlate, Fermate, and Dithane D-14 were effective against rust but not against bacterial leaf spot. Dithane D-14 caused stunting of the plants and a marked reduction in flower yield. Yellowing of the leaves occurred during bright, warm periods when Yellow Cuprocide was used.

CHRYSANTHEMUM

FOLIAR NEMATODE: NEW YORK. Control was nearly perfect with 25% wettable parathion at both Ithaca and Farmingdale. Poorer control was obtained with 20% parathion emulsion at Ithaca. Chlordane, TEPP, Lindane, and Black Leaf 40 were much less effective and did not give practical control. Chlordane gave fair control when used at 4 lbs. per 100 gallons but it left an objectionable residue.

SEPTORIA LEAF SPOT: NEW YORK. (Ithaca). Parzate (spray or dust), 549C (spray or dust), SR-406, Bioquin 1, or Fermate all gave equally good control followed closely by Crag Potato Fungicide and by Goodrite Z.A.C. CR-305 was also good. Actidione gave the poorest control of all fungicides tried. The ferbam materials remain first choice because of consistent apparent superiority in plant vigor and color.

GLADIOLUS

FUSARIUM ROT: ILLINOIS, MARYLAND, NEW YORK (Ithaca), NEW YORK, (Farmingdale), NORTH CAROLINA, OHIO, ONTARIO. In a cooperative test using a single variety from one source, Arasan, Ceresan M, Dow F-800, Dow 9B, Dowicide B, Lysol, mercuric chloride, New Improved Ceresan, and Puraturf 177 were compared with no treatment. Puraturf 177 was not effective in any location. There were fewer rotted corms when Dow F-800 was used but yields were variable. In Ohio and Ontario flower and corm yields in the Dow F-800 plots were less than the untreated, whereas in the other areas they were significantly greater. Flower yields were also less than the untreated at Ithaca. Mercuric chloride also reduced flower yields but not corm yields in North Carolina. Arasan, Ceresan M, Dow 9B, Dowicide B, Lysol, and New Improved Ceresan all resulted in greater flower and corm yields in at least 3 locations.

FLORIDA: New Improved Ceresan, Dow 9B, Spergon, Natriphene, N-N, 36L, and PMA were compared in preplanting treatments. Results with the last three were not sufficiently good to merit further testing. Best control was with New Improved Ceresan and with Dow 9B. Wettable Spergon and Natriphene gave equal control and caused least injury. Equal over-all preference was given to New Improved Ceresan and Spergon followed by Dow 9B and Natriphene.

ILLINOIS: Thirteen materials were tested on six varieties. New Improved Ceresan, mercuric chloride plus New Improved Ceresan, Dowicide B, Dow 9B (dip or dust), Dow F-800, and Seedox 50 controlled Fusarium rot about equally well. Puraturf 177 and Puratized Agricultural Spray (as a dust) were ineffective. Ceresan M, Lysol, Arasan and Tag 331 were fairly effective. In two other tests pre-storage treatments were tried. In one, Arasan and Phygon increased the number of rot-free corms and in the other Dow F-800 was very effective with Phygon less effective, but both injured the bases of the corms. Arasan was not effective in the second test.

SCAB: The corms used in the cooperative test mentioned above were from one source, but after a season's growth in the different locations the percent of scabby corms in the untreated varied from 5.3 to 62.2 and corm treatments for scab control did not appear to be effective in any location.

ILLINOIS. The following were compared on corms of seven varieties: mercuric chloride, 2-hour soak; mercuric chloride, 14-hour soak; mercuric chloride plus New Improved Ceresan, 30-minute soak; sulfur applied in the furrow before planting; and lime applied in the furrow before planting. The long soaks were most effective and the short soaks and the combination treatments were much less effective. Sulfur and lime each increased scab slightly.

LEAF SPOTS: FLORIDA. Spray compatibility tests were made with 5 fungicides and 4 insecticides. No disease or insects were involved. DDT, chlordane, and Toxaphene were each tested in combination with Dithane D-14-zinc sulfate, Dithane D-14-zinc sulfate-lime, Parzate, or with calcium liquid Parzate-zinc sulfate. Yields were not affected by any of the fungicides in combination with DDT or Toxaphene but yields were reduced when they were in combination with chlordane.

IRIS

FUSARIUM BASAL ROT: WASHINGTON. Equally good control was obtained with hot water-formalin plus Ceresan M, or plus Ceresan M combined with Tersan, or plus Tersan, or with Aretan alone. All of the hot water-formalin treatments caused injury because the bulbs were treated two weeks too late. Aretan was also injurious. Next best control was obtained with either of the following: Mersolite 8, Tersan plus Ceresan M, Tersan, or Ceresan M. Lime-sulfur was ineffective. Ceresan M was preferred and better control was obtained when bulbs were treated August 26 than when treated just before planting October 2.

NARCISSUS

FUSARIUM BASAL ROT: MARYLAND. In one experiment begun in 1945 and concluded in 1949 using the same bulbs and same treatments for 4 years, New Improved Ceresan and Mersolite 8 gave the best rot control followed by Arasan, Spergon, Tersan and Puratized Agricultural Spray. Fermate was not effective. Bulb yields were best with New Improved Ceresan followed by Spergon. New Improved Ceresan caused flower injury. In an experiment begun in 1946 and concluded in 1949, New Improved Ceresan, 2% Ceresan, Arasan, Mersolite 8 and Puratized Agricultural Spray all gave good rot control in each of the three years but the first two materials caused severe flower injury. Dowicide B gave good rot control but delayed flowering and injured the flowers; rot control was poor with Roccal, Copper 8, and Carbide and Carbon 341; and thiourea caused flower injury. Arasan SF, Mersolite P, Dow 9B and New Improved Ceresan gave good rot control for two years in a test begun in 1947. Bulb yields were best with the first three. Rot control was poor with Wettable Spergon, Puratized 177, bismuth subsalicylate, or Parzate.

WASHINGTON. Rot control was good when bulbs were dipped in solutions containing Mersolite 8 or Mersolite 8 plus Dioxane. Mersolite 8 dissolved in Carbitol before adding to the water was ineffective in controlling the rot.

ROSE

BLACK SPOT: ARKANSAS. Equal control was obtained with fungicides containing copper, ferbam, or sulfur. Injury was least with the copper treatment and greatest with the sulfur treatment. The ferbam material was Du Pont Rose Dust, the sulfur a 90:10 sulfur-lead arsenate mixture, and the copper was 4 parts Tennessee Corporation tribasic copper sulfate (26% Cu), 4 parts Nu-Z (55% zinc), 4 parts lead arsenate, 4 parts Armour sticker, 86 parts talc.

NEW YORK (Ithaca). Good control was obtained with manganese ethylene bis dithiocarbamate (either as a spray or as a dust), J. & P. Rose Spray, colloidal copper-white oil emulsion, Tag 331, Tag 331 plus wettable sulfur. Bioquin 1, Bouisol, COCS dust, Crag Fruit Fungicide 341C, and SR 406 gave fair control, and CR 305 and Rix both gave poor control. Rix and colloidal copper-white oil emulsion each caused severe burning. Bioquin 1, J. & P. Rose Spray, Tag 331 plus sulfur, and Crag Fruit Fungicide 341 C each caused slight burning during hot weather. Manganese ethylene bis dithiocarbamate as a spray was best from an over-all viewpoint because it gave good control, did not burn and left no unsightly residue.

MILDEW: NEW JERSEY. Control of mildew on Mme. Joseph Perrand roses out-of-doors was best with Bordeaux 2-4-100, Tribasic copper, Parzate, Puratized Agricultural Spray, and Bioquin 1. It was poor with Fermate, and fair with SR 406 or Crag 341 C. Bordeaux and tribasic copper each caused severe leaf burn, and Puratized Agricultural Spray caused slight necrotic spotting in midsummer. Parzate, SR 406, Crag 341 C, and Bioquin 1 were given equal over-all preference.

SNAPDRAGON

RUST: NEW YORK (Ithaca). Rust control was in the following descending order: Parzate (spray or dust), Fermate, 549 C (spray), Goodrite Z.A.C., 549 C (dust), CR 305, SR 406, Bioquin 1, Actidione, and Crag Potato Fungicide. The first gave near-perfect control and the last was no better than the untreated. Crag Potato Fungicide was quite toxic to the foliage, and CR 305 injured plants under some conditions. Plants sprayed with Parzate were slightly paler. Bioquin 1 gave poor control of rust but good control of secondary invaders and consequently plants sprayed with Bioquin 1 looked good from a distance.

TULIP

BOTRYTIS: WASHINGTON. Good control of primary "fireheads" was obtained when bulbs were soaked in water containing Aretan before planting. No control was obtained when bulbs were soaked in water containing Semesan Bel, Wettable Spergon, or Fermate. Aretan, and to a lesser extent Semesan Bel, reduced flower height, caused some blasting, and also decreased the yields of bulbs harvested. Spergon-or Fermate-treated bulbs frequently yield better than other bulbs for some unexplained reason.

TURF

BROWN PATCH. In a cooperative test with Bent grasses in four states (Iowa, Massachusetts, Rhode Island, and New Jersey) Calochor was most effective followed by PMAS, Spergon W and Tersan. Results were fair with Puraturf and Puraturf G-G and poor with Cadminate and Crag 531. Merck H258 T was ineffective. Temporary yellowing after each application occurred with PMAS and Puraturf in New Jersey and Rhode Island. Severe burning occurred with PMAS and Calochor in Massachusetts whereas Calochor caused only slight injury in Rhode Island and New Jersey.

DOLLAR SPOT. In a similar test in six states (California, Iowa, Massachusetts, Pennsylvania, Indiana and Rhode Island) Puraturf 177 and

Crag 531 gave the best results followed by Cadminate, Puraturf G-G, Calochor, Merck H258 T, PMAS, and Puraturf in that order. Spergon W and Tersan were not effective. Temporary yellowing following applications of PMAS or Puraturf occurred in California, Indiana and Rhode Island. PMAS caused severe burning in Massachusetts and Calochor caused burning in both Massachusetts and Rhode Island.

HELMINTHOSPORIUM LEAF SPOT RHODE ISLAND. Puraturf gave complete, and PMAS nearly complete, control. Cadminate, Puraturf G-G, and Calochor were nearly as effective whereas Crag 531, Merck H 258 T, Puraturf 177, Spergon W, and Tersan were much less effective.

SHADE TREES AND SHRUBS

HOLLY (Ilex opaca) NEW JERSEY. Severe leaf burn and defoliation occurred with Bordeaux at 4-4-100, at 2-4-100, and even at 1-4-100 in the summer. This is particularly important since publications on holly suggest "try Bordeaux for foliage diseases". Severe burn and defoliation also occurred with Tribasic copper at 4-100, 2-100 and 1-100. Puratized Agricultural Spray caused some slight chlorotic ring-spotting. Fermate, SR 406 and Parzate did not cause injury and the best foliage color occurred where the first two were used.

FUNGICIDES TESTED ON SHADE TREES IN ILLINOIS[1]

Fungicide tested	SHADE TREES						
	Black walnut	Elm, American	Ulmus parvifolia	Ulmus pumila	Norway maple	Hard maple	Sycamore
Arathane WP-25	+	+	+	+	+	+	+
Bioquin 1							+
Bordeaux + zinc sulfate	+	+					
Carbide and Carbon #5379	+		+	+	+	+	
Crag Fruit Fungicide 341 C	+	+	+				
Crag Potato Fungicide 658		+				+	
CR 305	+	+	+	+	+	+	
Cupreous Powder No. 3005	+	+	+		+		+
Fermate	+	+			+		+
Goodrite Z.A.C.		+	+			+	
L-658		+					
Manganese ethylene bis dithiocarbamate		+	+	+	+	+	+
Parzate		+				+	+
Puratized Agricultural spray	+	+	+		+		+
Puratized Apple Spray	+	+	+	+	+	+	+
Puraturf GG	+	+					
Tag Fungicide # 331	+	+	+	+	+	+	+
Zerlate		+					

FUNGICIDES TESTED ON SHADE TREES IN ILLINOIS (continued)

Fungicide tested	SHADE TREES							
	Linden	Mountain Ash	White Ash	Catalpa	Red Oak	Hackberry	Honey Locust	Russian Olive
Arathane WP-25	+	+	+	+	+	+	+	+
Bicquin 1								
Bordeaux + zinc sulfate								
Carbide and Carbon #5379	+	+	+	+	+	+	+	+
Crag Fruit Fungicide 341 C								
Crag Potato Fungicide 658								
CR 305	+	+	+	+	+	+	+	+
Cupreous Powder No. 3005								
Fermate			+					
Goodrite Z.A.C.								
L-658								
Manganese ethylene bis dithiocarbamate								
Parzate								
Puratized Agricultural spray			+					
Puratized Apple Spray	+	+	+	+	+			
Puraturf GG			+	+	+	+		
Tag Fungicide # 331	+	+	+	+	+	+	+	+
Zerlate								

[1]Because of dry weather, leafspot diseases on the shade trees listed were insufficient to give control data. Of the materials tested only Fermate caused injury and this was only on the underside of black walnut leaves.

EFFECTIVENESS OF MATERIALS ON ORNAMENTALS

ACTIDIONE. Tested for control of azalea blight, mum Septoria, snapdragon rust and ineffective for all.

ARETAN. A Dutch mercury product and looks good for bulb treatments for controlling Fusarium rot of iris and fire of tulips.

BIOQUIN 1. Good control of Alternaria on carnations but Zerlate recommended because it is cheaper. Also looks good for Septoria on mums. Only fair for rose blackspot but promising for mildew. Gave poor rust control on snapdragons but good control of secondary organisms and plants looked good from a distance.

BORDEAUX. Caused serious injury to holly foliage in spite of fact publications say "Try Bordeaux mixture for holly leafspot control."

CR 305. Looks promising for Alternaria on carnations, fair for snapdragon rust and was no good for rose blackspot.

CRAG 341 C. Fair for mildew and blackspot on roses.

CRAG POTATO FUNGICIDE 658. No good for snapdragon rust or azalea petal blight.

DOW F-800. Looks good for control of Septoria leafspot of mums.

GOODRITE Z.A.C. Looks promising for carnation rust.

MANGANESE ETHYLENE BIS DITHIOCARBAMATE. Very promising for control of blackspot of roses.

PARATHION. One of the most striking results were those of Dimock and Ford in controlling mum leaf nematodes with spray applications.

PURATURF 177. Not effective for controlling Fusarium rots of gladiolus or narcissus.

RIX. No good for rose blackspot and caused injury.

SR 406. Fair for mildew and blackspot on roses and snapdragon rust, promising for Alternaria on carnations and Septoria on mums.

549 C. Looks good for control of Septoria leafspot of mums.

GENERAL. Superiority of carbamate materials again demonstrated in controlling azalea petal blight, rust on carnations and snapdragons, and Septoria on mums.

The cadmium-containing fungicides, Cadminate, Crag 531, and Puraturf 177, were superior for the control of dollar spot of turf. The organic phenyl materials also gave control but were not so effective. The cadmium materials were of little value for brown patch of turf.

RESULTS WITH TOBACCO AND SPECIAL CROPS

TOBACCO

BLUE MOLD

GEORGIA (Tifton). Most growers used ferbam sprays (4-100) or dusts (15%) with excellent results. Those few growers using ferbam-salicylic acid spray (1-100) or zineb dust (10%) likewise obtained excellent control. It is estimated that 85% of growers used sprays or dusts.

FLORIDA (Gainesville). A mild attack was noted during plant-growing season with a heavy attack on plants after transplanting to the field. In tests very satisfactory results were obtained with Fermate (ferbam) dust (15%), Parzate (zineb) dust (10%) and Fermate-salicylic acid spray.

FLORIDA (Quincy). Yields of seedlings per square yard and preferential rating in descending order were Dithane Z-78, 262; Parzate, 249; Fermate, 183; and check, 137. No injury was noted from any of these fungicides.

STAGHORN SUMAC

FUSARIUM WILT

COLORADO (Ft. Collins). Dithane Z-78 (5 lbs./100 sq. ft.) and copper sulfate (2 1/2 lbs./100 sq. ft.) were applied once to the plant bed soil with hand duster and garden hose, respectively. Dithane Z-78 gave the best control and was the preferred treatment. Both were equally safe.

RESULTS WITH SOIL FUMIGATION AND DRENCH TESTS

In tests at Windsor, Connecticut, Iscobrome D at 30 gal. per acre, Dowfume W-40 at 15 gal. per A, and DD at 30 gal. per A were applied to the soil with a tractor-drawn shank applicator ten days before setting tobacco plants. Most effective control of meadow nematode was obtained with Dowfume W-40 and Iscobrome D.

In tests at Oxford, North Carolina, propylene oxide (40 cc. per sq. yd.), Iscobrome D (255 cc. per sq. yd.) and chloropicrin (38 cc. per sq. yd.) were applied with a sprinkling can, and methyl bromide (1 lb. per 10 sq. yds.) was applied with a gas applicator to soil of tobacco plant beds. The time of application in relation to sowing of tobacco seed was not stated. The methyl bromide gas was rated first in control of meadow nematode (black shank), Iscobrome D and chloropicrin second, whereas propylene controlled weeds but not the nematode. None controlled nematodes, however, unless the fumes were confined, sisalkraft paper being used for this purpose.

In tests at Florence, South Carolina, Dowfume W-40 and DD were applied to tobacco fields at 5, 10, and 15 gal. per A in row treatments and 20 and 30 gal. per A in broadcast treatments. The time of treatment in relation to setting of the tobacco plants is not stated. Though all dosages increased yield, the 30 gal. per A dosage of both materials was most effective against root-knot and meadow nematode. At this dosage neither material proved the superior. With both, the maximum effect on nematode was obtained when the soil was packed after treatment. Dowfume W-40 was less agreeable to handle and gave indications of retaining a residual effect in the soil longer than DD. Because of an adverse effect on the quality of the cured product, however, the general use of such soil fumigants on flue-cured tobacco lands was not recommended.

In tests at Quincy, Florida, Dowfume W-40 at 15 gal. per A and DD at 20 gal. per A were tested against the root-knot nematode in tobacco soils. In one test the fumigants were applied for the second consecutive season. Treatments were given to different plots on October 8, 1948; November 30, 1948; and February 4, 1949. Judging from the root-knot index, the timing of the Dowfume treatment did not affect control. With DD, however, apparently the November and February treatments were more effective than the October treatment. All treatments of both materials increased the yield of tobacco, the earlier treatments more than the later ones. In a second test, DD and Dowfume W-40 treatments were given on December 16, 1948 for the third consecutive season. Here the more effective control and higher yield was obtained with Dowfume.

In tests at Gainesville, Florida, Dowfume W-40 and DD were applied in drill rows at the rate of 8 to 10 gallons per A 5 weeks before tobacco plants were set in the rows. This method of treatment is said to be as effective as broadcast application and cheaper. In order to avoid introducing nematode-infested soil into the treated area, fertilizer was placed along the side of the drill rows at the time of fumigation treatment. Though these materials gave only a moderate control of root-knot nematode, the yield of tobacco was increased by treatment. Neither material proved superior in this respect. The quality of the tobacco, on the other hand,

was reduced by the DD treatment.

In tests at Elba, New York, 300, 400, 450, and 500 lbs. per A of DD and 180, 220 and 260 lbs. per A of Dowfume W-40 were applied for control of bulb and stem nematode (bloat) of onions. One treatment was given in autumn before spring sowing, a tractor-drawn shank-type applicator being used. Neither of the dosages of Dowfume employed controlled the nematodes. With DD, the 450 and 500 lb. per A dosages gave the best control but proved more injurious to the plants than the 300 lb. dosage.

CONTROL OF FUSARIUM ROOT ROT OF PEAS WITH FUMIGANTS

In tests at Geneva, New York, one treatment of Larvacide at 104 gal. per A, Dowfume G at 260 gal. per A, and Dowfume N at 130 gal. per A was given 12 days before peas (Thomas Laxton) were planted. Larvacide gave control of root-rot caused by Fusarium solani var. martii; the other materials were ineffective. None, however, are recommended for control of this disease.

RESULTS WITH SEED TREATMENTS

Forms for reporting the relative merits of seed treatment materials, as determined by tests on seeds of various crops, were sent to 86 workers in agricultural experiment stations and colleges in the United States and Canada in the fall of 1949. Twenty persons responded by returning the forms filled out with the information requested. Ten others replied that no such information was available because no tests had been made. The remaining 56 failed to indicate any interest in the work of this committee.

The 21 replies received represent the cooperative effort of about 46 workers in 24 States and 4 Canadian Provinces in testing 50 materials on seed of one or more of 17 agricultural crops. The data on most of these crops, however, are too meagre to serve as a basis for making definite recommendations. They are summarized in table 1.

BARLEY

Reports from Canada representing experiments at 6 stations in 3 provinces indicate that Ceresan M, Panogen (8 and 14), and Leytosan are the favored standard treatments for the control of covered smut and blight (Helminthosporium sativum). The experimental materials M.T.H. and R 118-A were effective in some tests. In experiments with winter barley carried out at 9 stations in the Southeast, the mercurials, Panogen 14, and the Ceresans, eliminated covered smut with 1.4 to 15.3 percent in the controls, and also stripe-disease with 3 to 18 percent in the controls. Fairly good smut control was obtained also with the non-mercurial organics, Phygon, Spergon and Arasan, although these materials are not generally recommended for barley because they were ineffective against stripe disease.

Similar results were obtained at 10 stations in the spring-barley area. The Ceresans (1/2-ounce), Panogen 14 (1.5 ounce), Phygon (1 ounce), and Arasan (2 ounces) eliminated covered smut in Odessa barley with from 7 to 20 percent in the controls. Panogen 14 at 3/4 ounce per bushel was not completely effective. Dow 9-B and Seedox, both at 2 ounces per bushel were relatively ineffective. Stripe disease was eliminated by the Ceresans and reduced to less than 1 percent by Panogen 14 (1.5 ounce), with 8 to 15 percent in the controls. Phygon reduced infection to 5 percent or less.

OATS

In Kansas, Ceresan M and Panogen 14 reduced the percentage of smut infection to 0.5 and 1.7 percent respectively, while 74 percent appeared in the controls. These materials also improved emergence in oat varieties susceptible to Victoriae blight but not in resistant varieties.

In Ontario a modified form of Agrosan was rated superior to Panogen 14 and 8 in improving emergence and combating Helminthosporium victoriae. In tests at three stations in Manitoba, Panogen, Ceresan M, and Leytosan were rated best among 8 materials with respect to their effect on stand of mature plants and also on control of Victoriae blight.

In cooperative tests at 6 stations in the Southeast, loose and covered smuts were completely eliminated by the Ceresans and by Panogen 14, while

Table 1. Summary of Seed Treatment Reports for 1949

Seed Treated	Location of Experiments: Provinces (Number)	Location of Experiments: States (Number)	Reports received (Number)	Materials tested (Number)	Best Results from*
Barley	3	17	4	14	Ceresan, Panogen, Leytosan
Wheat	3	17	5	16	Ceresan, Panogen, Anti carie
Corn	-	7	4	10	Arasan, Phygon L224, Spergon
Rice	-	3	4	10	Ceresan M, Arasan, Spergon Phygon, Cuprocide, K.F. 467
Sorghum	-	2	2	20	Arasan, Phygon, Panogen Ceresan M, Spergon
Flax	2	5	2	9	Ceresan M, Panogen, M.T.H.
Cotton	-	1	1	4	Seedox, Ceresan M, Dow 9-B
Peanuts	-	1	1	7	Arasan, Phygon, Spergon
Clover	-	1	1	3	Arasan
Alfalfa	-	1	1	3	No benefits
Peas	-	6	4	10	L-640, Spergon, Arasan, L224, KF 468
Beans	-	5	3	13	Arasan, Spergon, 5400, L-640, 531
Tomatoes	-	4	2	7	Cuprocide, L-640, 854, Arasan
Cucurbits	-	3	2	10	N. I. Ceresan, Semesan, Arasan, 5400, 854
Cabbage	-	2	1	6	Arasan, L-224, Semesan, 5400
Spinach		4	1	6	854, 5400, Arasan, L-640
Beets		3	1	6	Arasan, 5400, 854

* Not always listed in order of effectiveness.

from 8 to 22 percent appeared in the controls. Spergon, Phygon, Arasan and Seedox were highly unsatisfactory. At 10 Western stations satisfactory smut control was obtained with the Ceresans (1/2 ounce) and Panogen 14 (1.5 ounce) with 16 to 45 percent infection in the controls. Phygon, Arasan, Seedox and Dow 9-B were unsatisfactory.

WHEAT

In Kansas, with 78 percent infection in plots from untreated seed, the Ceresans at 1/2 ounce and M.T.H. at 1 ounce per bushel eliminated bunt, while Arasan, Phygon and Spergon, all at 2 ounces per bushel, reduced it to 1.5, 1.2 and 0.8 percent respectively. Mercan was totally ineffective. At 6 stations in the eastern winter wheat area, bunt in wheat was eliminated by the Ceresans and Panogen 14 and reduced to less than 1 percent by Spergon, Phygon and Arasan. At 10 stations in the Western spring-wheat area, similar results were obtained with these materials. Dow 9-B and Seedox were unsatisfactory. At Beltsville, Maryland, none of these materials caused any significant increase in yield when applied to clean disease-free seed of Purplestraw wheat.

At Pullman, Washington, the Ceresans were best in bunt control in Idaed and Elgin wheats. Phygon paste 1-500, Spergon, chromate L-224 and chromate 640 were inferior and Parson's Seed Saver Dust was highly unsatisfactory. At 6 stations in Canada the percent of bunt infection ranged from 26 to 81 percent and averaged 45 percent. Anti carie at 3/4 ounce per bushel gave the best control of bunt. Next in order of effectiveness were Panogen 14, (1 oz.), Ceresan M (1/2 oz.), Leytosan (3/4 oz.), and Benesan (3 oz.).

CORN

Reports were received on experiments in Iowa, Illinois, Wisconsin, New York, New Jersey, Ohio, and Florida.

In Illinois, Arasan, Spergon, and Phygon, in the order named, were most effective in increasing yields of corn hybrids U.S. 13 and Ill. 972. K.F. 467 and L-224 were only slightly less effective.

In Wisconsin, Arasan S. F. at 1 ounce per bushel was found best for corn. Slightly heavier slurry applications were more effective but were difficult to apply. Phygon was almost as effective as Arasan, while Spergon was rated somewhat inferior.

In Iowa, L-224 (zinc mercury chromate) was rated as good as, or better than any other treatment. No. 854, No. 5400 and Arasan were nearly as good. Panogen 14 applied at 2 1/2 ounces per bushel (excessive) caused injury to corn in storage. In cooperative experiments in New York, New Jersey, Florida and Ohio, L-224 seemed to maintain its lead as the best treatment, with 854, 5400 and Arasan sharing second place, and L-640 and Spergon in third place.

RICE

Only four reports on rice seed treatment were received. At Stuttgart, Arkansas, five treatments were rated as follows with respect to

their effect on stands of Zenith and Blue bonnet rice: Ceresan M (1/2 oz. per bushel), Arasan (1.5 oz.), Dow 9-B (1.5 oz.), Phygon XL (1.5 oz.) and Yellow Cuprocide (1 oz.). Yellow Cuprocide, however, was considered the best treatment for rice sown in water.

In experiments at Beaumont, Texas, Ceresan M was rated best on Bluebonnet seed, with Arasan and Spergon second, and Yellow Cuprocide third. On Rexoro rice, Spergon was rated best, with Arasan second, and Ceresan M third. Dow 9-B was found to cause injury to stored Rexoro seed. Cuprocide, it was found, may cause injury to pre-sprouted seed.

At Crowley, Louisiana, seed of Magnolia rice was soaked in water for 24 hours after treatment, held moist for 24 hours and then water-planted with continuous flooding. None of the treatments increased germination but all except Arasan and K.F.-467 improved stands. Yellow Cuprocide (2 and 4 oz.), Tribasic copper (4 oz.), and No. 640 were rated about equally beneficial.

In tests with drilled seed of Bluebonnet rice, K.F. 467 was rated best in improving stands, Spergon was second and Phygon XL and Ceresan M third. In general, these materials along with Arasan were rated about equal for treating drilled seed of this variety.

SORGHUM

Among 15 materials applied to seed of Bonita, Sooner milo and Plainsman at Chillicothe, Texas, Arasan was most effective in improving field emergence while Spergon was almost as good. These were followed closely in effectiveness by Coppercarb, Zerlate, Fermate, Parzate, 2 percent Ceresan, and Phygon. Data on disease control were not recorded.

In emergence tests at Beltsville, Maryland, at 20° and 25°C., results were rather erratic, especially with Leoti sorgo. In general, Phygon, Panogen 14 and Arasan were most beneficial to emergence in Leoti and, along with copper carbonate, also in Sharon kafir.

Perfect control of covered kernel smut in both varieties was obtained with Phygon dust (2 oz.), Ceresan M (1/2 oz. dust and slurry), Panogen 14 (3/4 oz.) and Aagrano (1/2 oz.). Spergon (2 oz.), Arasan (2 oz.), Phygon slurry (2 oz.), and copper carbonate (2 oz.) eliminated smut in kafir but not in Leoti because of its persistent glumes. Infection in the kafir and Leoti checks was 29 and 46 percent respectively.

FLAX

In Minnesota, seed of three flax varieties, Crystal, Sheyenne, and B-5128, was commercially treated with Panogen (the older 1.2 percent product) at 3 fluid ounces per bushel. Samples of treated and untreated seed were stored in the laboratory for 10 months. The three lots of treated seed, in the order named, germinated 93, 87.5 and 46.4 percent respectively, better than the corresponding untreated controls. Portions of the three samples of untreated stored seed were then treated with Semesan Jr. (1 percent ethyl mercury phosphate) by the excess method and planted a day later along with untreated seed. Emergence from the treated samples was 50, 25, and 40 percent respectively better than from the three corresponding untreated seed lots.

Seed of Crystal flax was treated with Panogen 14 at rates of 3/16, 3/8, 3/4, 1 1/2, 3, 6 and 12 fluid ounces per bushel. In paper towels, germination was 100 percent and 55 percent at the 6 and 12 ounce rates respectively. In sterilized soil, the highest germination, 95 percent, followed the 3-ounce rate of treatment, with 60 and 35 percent at the 6 and 12-ounce rates respectively.

Panogen 14, applied to seed of Dakota, Crystal, and Minerva flax at 1 1/2 ounces per bushel increased the yield in field plots 15 percent, while N.I. Ceresan and Ceresan M applied at the same rate each increased yields 28.4 percent.

In cooperative experiments at 10 stations in Canada and the United States, flax seed rot, aggravated largely by a high percentage of cracked seed, was combatted most effectively by Ceresan M (1 1/2 oz.), Panogen 8 (3 1/2 oz.), Panogen 14 (1 1/2 oz.), and M.T.H. (2 oz.).

OTHER CROPS

COTTON

One report from North Carolina rated Seedox at 1.5 ounces per bushel as the preferred treatment for combatting seedling diseases. Ceresan M at 1 ounce per bushel (dust or slurry) and Dow 9-B at 1.5 ounces (dust or slurry) shared second place.

CLOVER AND ALFALA

A report from Illinois indicated some significant increases in germination and also prevention of damping-off in sweet clover and common white clover following treatment of seed with Arasan and Ceresan at the rather heavy rate of 2.4 to 4.8 ounces per bushel. Heavier applications caused injury. No benefit and some injury followed similar treatment of red clover seed.

Treatment of alfalfa seed with Arasan, Ceresan and Phygon resulted in no benefits to stands.

PEANUTS

One report from Alabama rated Arasan as best for combatting seed rot and damping-off in runner peanuts, with Phygon second and Spergon third.

PEAS

In Maryland, Arasan and Spergon were rated best for Pride peas. In cooperative experiments at six stations in four states, L-640 was rated best for emergence, and L-224 second.

In Wisconsin KF 468 was best for damping-off control followed by Phygon, Spergon, Arasan, Dow 9-B, and Phygon XL in that order. Arasan SF gave poor results.

BEANS

In Colorado No. 531, a calcium-zinc-copper-chromate complex, was rated best for Pinto beans with Goodrite second. In a three-State cooperative experiment, Arasan, 5400, L-640, 854, Spergon, and L-224 were rated equally effective. 5400 was rated best for lima beans with Arasan second and Spergon third.

TOMATOES

A report from Jacksonville, Texas, recommended Yellow Cuprocide as a safe and effective treatment for tomato seed. Cooperative experiments in New York, New Jersey and Florida rated L-640 and 854 as best for improving emergence with 5400 and Arasan second. Spergon and L-224 were rated ineffective.

CUCURBITS

At Norfolk, Virginia, Arasan (1/8 percent by weight) was best for emergence in cantaloupes while N.I. Ceresan (1/4 percent) proved best for watermelons. For cucumbers, Semesan seemed slightly better than Arasan, N.I. Ceresan, mercuric chloride (1-1000 for 10 minutes) or Cuprocide, although the differences were not significant. In cooperative tests in New York and New Jersey, No. 5400 was rated best for emergence in melons with No. 854, Spergon, Arasan, No. L-640 and No. L-224 next in order of effectiveness.

CABBAGE

At three stations in New York and New Jersey, Arasan and L-224 were rated best for improving emergence in two varieties of cabbage, with Semesan, 5400, 854, and L-640 following in order of effectiveness.

SPINACH

Emergence tests on seed of four varieties of spinach were carried out at six stations in New York, New Jersey, Ohio and Florida. The three materials, 854, 5400 and Arasan, were rated about equal in improving emergence, with L-640 and L-224 rated second in effectiveness, and Spergon third.

BEETS

Emergence from seed of Detroit Dark Red Garden beets in tests at six stations in four States was improved most by Arasan, and next in order of effectiveness were 5400, 854, L-640 and L-224.

GENERAL APPRAISAL OF FUNGICIDES FOR SEED TREATMENT

Only about 20 of the 50 materials tested as seed treatment, are standard commercial products now being manufactured and sold on the

American market for that purpose. Most of the other materials are still somewhat in the experimental stage, or are products that are generally intended for other purposes, such as control of foliage diseases or insects, fumigation of the soil or general disinfection. The more commonly used seed disinfectants and protectants mentioned are listed below, along with their chief uses.

ANTICARIE. For seed of wheat; sold in Canada for the control of bunt in wheat.

ARASAN (dust or slurry). For seed of corn, peanut, flax, sorghum, legumes, grasses, sugar beet, and most vegetables.

NEW IMPROVED CERESAN. For seed of barley, flax, oats, and wheat. It is being replaced to a great extent by Ceresan M.

CERESAN M (dust or slurry). For seed of barley, flax, oats, rice, sorghum, wheat, sugar beet, cotton, tomato, and some forage crops and vegetables. At present, it is probably the best material on the American market for cereal seed treatment.

COPPER CARBONATE. For seed of wheat and sorghum.

CUPROCIDE (Yellow). For seed of celery, carrot, pea, spinach, squash, beets, cucumber, egg plant, melon, pepper, chard, tomato, and other vegetables. It is likely to injure seed of lettuce, crucifers, and onion.

DOW 9-B. For seed of cotton, peanut, pea, rice, and some vegetables.

FERMATE. For seeds of pea, onion, cabbage, and lettuce, and for potato and sweet potato. Used largely as a foliage fungicide.

FORMALDEHYDE. For preventing onion smut by applying it to furrow with seed. Also for seed of beet, celery, wheat, oats, barley, and some other seeds when better materials are not available.

LEYTOSAN. For seed of barley, flax, oats, and wheat. Sold in Canada.

PANOGEN. For seed of barley, flax, oats, sorghum, wheat, and sugar beets. Its frequent changes in composition have retarded its general acceptance.

PHYGON XL (dust or slurry). For seed of corn, sorghum, rice, wheat, sugarbeet, peanut, pea, bean, and a number of vegetables.

SEEDOX. For seed of cotton. Not suitable for cereals.

SEMESAN (dust or soak). For seed of most vegetables and flowers.

SPERGON (dust or slurry, with or without DDT). For seed of corn, rice, sorghum, wheat, peanut, pea, bean, and most vegetables.

OTHER MATERIALS. A considerable number of unnamed experimental materials, usually referred to by numbers, were tested on seeds of several crops. L-224 is promising on seed of corn, peas, cabbage, beans, and several other vegetables. In experiments with vegetables, 5400, 531, 854, and L-640 also were fairly effective at times. These materials should be tested more extensively. K.F. 467, R118-A, Agrosan, Aagrano, and Mercuran also looked promising in some reports, but more extensive tests are needed to truly evaluate their effectiveness.

GENERAL. In general, Ceresan M continues to be the most widely used commercially available treatment for cereals, and is used rather extensively on some other crops. Arasan, Phygon, and Spergon continue as the principal materials for treating seed corn, although other compounds are on the way up. Vegetable seed treatment commercially is very similar to what it was a year ago as few, if any, outstanding fungicides have been placed on the market during that time.

The seed treatment situation in Canada is very ably summarized in the following statement by Dr. J. E. Machacek, plant pathologist at the University of Manitoba:

> "Seed treatment occupies a prominent place in Canadian agriculture. About half of our grain farmers treat their seed grain annually. Custom treating (by elevators, etc.) is very limited. Examination of seed for disease by certain industrial laboratories in Western Canada provides information regarding the need for treatment. Ceresan M, and Half-ounce Leytosan are the principal mercurials in use, chiefly as dusts. The new fluid treatments, Panogen 8 and Panogen 14, are receiving favorable comment but the cost of the applicator is still too high for the average farmer. The French non-mercurial dust, Anticarie SD, is expected to find only limited use owing to its limited control of disease. It is recommended for use against bunt (stinking smut) of wheat. Formaldehyde, in spite of recommendations against its use, is still comparatively popular with farmers."

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